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*Illustrated.

An Inefficient Efficiency Engineer

"What is the old nuisance about now?" is a query propounded to us by a railroad officer, also a member of the American Society of Mechanical Engineers, who recently received a circular from a much-advertised efficiency engineer criticizing the lack of facilities provided by the society. Our answer is that, like Clifford Thorne, he is bound to seek notoriety, particularly now that the public at large is forgetting his attacks on the railways and is getting so used to seeing his flamboyant efficiency correspondence school advertisements that they have grown tired of them. The editor of the American Machinist, who has carefully investigated the claims made in the circular and discusses them in detail in this week's issue of his publication, shows that practically all of the facilities, the lack of which is deprecated, are already provided, and makes this significant statement: "The circular shows that he knows nothing about the society's work. The first principle of efficiency is a knowledge and proper use of facts. Judged by this standard and in this case the author of the circular is amazingly inefficient."

A Substitute for the Full Crew Law

A newspaper item received recently stated that it is proposed to introduce in the Illinois legislature a bill to limit to 50 the number of cars in a freight train "to avoid the obstruction of street crossings by long trains." Another newspaper received the same day mentioned such a bill as a part of the legislative program of the Brotherhood of Railroad Trainmen. Evidently the overwhelming defeat of the full crew law in Missouri by a referendum vote of the people at the recent election has taught the labor leaders that legislation to create jobs must be sugar-coated in another form, for, of course, the purpose of the two laws is the same. The brotherhood has been able to secure the passage of full crew laws in a number of states by reinforcing the votes of those legislators who are always willing to jump at the call of the labor leader with those of the class of politicians who have kept themselves in office by always opposing the railroads, and probably with those of a few who were deceived by the argument that more men on a train would promote safety. In the same way it is doubtless believed that to the votes of those who will always vote for labor against the railroads may be added some of those who may remember the exasperating delays sometimes caused by waiting for a long freight "drag" to pass a crossing. One of the chief methods by which the railroads have been able partially to offset the rising tendency of wages and expenses of all kinds has been by increasing the trainload. The public is gradually learning one salient fact of railroad economics, and that it is the public that pays the railroad's expenses, and it should not be especially difficult to convince the people that hauling shorter trains will not help the railroads to give better service, reduce rates or pay higher wages to their employees. By increasing expenses it will tend to increase rates. A law to limit the length of trains has one advantage over the "full crew" law. Both mean the employment of more men, but the latest plan to legislate men into jobs would make it necessary for them to work for their pay.

Apportioning Grade Separation Costs

In a decision handed down a few days ago involving the separation of grades between the Chicago & Alton, and an important highway near Independence, Mo., the Public Service Commission allotted 60 per cent of the cost to the railroad and 40 per cent to the county. At Tower Grove, St. Louis, this commission made a similar division between the Missouri Pacific, the Frisco and the city a few months ago. In a hearing involving the extension of an electric line along a public highway to reach a proposed state institution near Alton, Ill., the Public Utilities Commission has just rendered a decision establishing a division of cost for the separation of the grades of this line with the Chicago & Alton and the Chicago, Burlington & Quincy. The Alton and the Burlington are ordered to pay 33⅓ per cent of the cost of their respective crossings, the state 31⅔ per cent, the electric line 25 per cent, and the city and township the remaining 10 per cent. While these are by no means the first instances in which the cost of such work has been thus divided, this practice has not been sufficiently common, especially in the west. In Chicago, for instance, where over $70,000,000 already has been spent for track elevation, the roads have been required to pay the entire cost of the work with the exception of the incidental damages which

the city assumes. These recent rulings indicate a desire on the part of the commissions to apportion the cost of the improvements on the basis of the benefits secured and the rights of the parties at interest. Such a practice not only effects a more equitable distribution of the cost, but it also serves as a check on the demands of the public, for the people are naturally conservative when they know they will be called on to pay their share of the cost. This was illustrated at Milwaukee where in a hearing before the railroad commission some time ago regarding the separation of grades for a considerable distance the city originally demanded the construction of subways at a large number of streets, but the statement of the commission of its intention to assess the city for a portion of the cost resulted in a very material modification of its demands. There is no railway improvement the benefits of which the public shares with the railroad more directly than the separation of street and railway grades, and it is refreshing to see a more general realization of this on the part of the commissions.

THE DECISION A VICTORY FOR REGULATION BY COMMISSION

THE original decision of the Interstate Commerce Commission in the five per cent rate case caused it to be severely criticized. There was a strong feeling in many quarters that the decision indicated an indisposition on the part of the commission to recognize the conditions which had arisen in the railway business, and to deal with rates accordingly. Many of the best friends of regulation by commission began to grow sceptical regarding its success.

The decision rendered by the commission last week, in the rehearing of the five per cent rate case, puts both the commission and the policy of regulation by commission in a different light. The commission acted very promptly in giving the eastern roads a re-hearing; it conducted the taking of testimony expeditiously; it rendered a decision as speedily as it could be expected to, and it granted the railways most of the advances for which they asked. It refused to grant some of them, but on the other hand it had already permitted some advances in passenger rates for which the railroads had not originally asked, and it had suggested to them various reforms in their service and rates the adoption of which would increase their net revenues.

On the whole, the outcome reflects credit on the commission and on the policy of regulation by commission. The commission rose to its responsibility and dealt with the question as a big question of public policy. Important as is its action in granting a horizontal advance in rates, of hardly less importance is its further action in directing attention to the need for reforms to remove the inconsistencies and discriminations in service and rates which every student of the subject knows exist. Not only is it the function of regulation by commission to enable the railways to earn a return which will be just alike to them and the public, but it is also its function to see that the services rendered and the charges made by them are not unfairly discriminatory; and the commission is to be commended for trying to perform both of these functions in the same case.

While the final outcome is good, it cannot be said that either the time taken or the means used in arriving at it have been satisfactory. While the re-hearing was conducted and the final decision reached with commendable promptness, there is a general feeling among railway and business men which is not without justification, that there are too many suspensions of proposed advances in rates, and that it usually takes the commission too long to dispose of important rate cases. The trouble is not so much with the commission as it is now constituted, as it is with the laws which have created it and under which it acts. The laws have piled burden after burden on the commission without providing it with the organization and facilities needed to enable it properly to do its work.

Therefore, while satisfaction is being expressed with the outcome of this particular case, the need for permanent and fundamental reforms in the present policy and system of regulation must not be allowed to be forgotten. This is a problem to which the best minds in public life and in business life should devote themselves. It is futile and unjust to criticise the commission as now constituted for not doing what no body of seven men, with no better organization and facilities than the commission has, could do. The commission is doing its best. The railway men, business men and public men of the country should unite with it in helping it to do better.

THE EFFECT ON BUSINESS

THE decision of the Interstate Commerce Commission in the eastern rate advance case seems bound to have a good effect on business. The effect may not become immediately manifest, but it is only a matter of time until it will be felt. It is probable that on the basis of the normal movement of traffic the advance in both freight and passenger rates which the commission has now authorized will increase the earnings of the eastern roads by from $30,000,000 to $40,000,000 a year. The traffic moving at present is light, and so long as it continues to be so light the eastern roads will probably have to feel their way somewhat carefully, but manifestly an increase of $30,000,000 in their annual earnings will make it practicable for them greatly to increase their total expenditures. This amount of money, if used entirely for the purpose of paying a return on new capital, would yield six per cent per annum on $500,000,000. No further statement is necessary to show how important the direct effects of this advance in rates may be in helping the railways to get needed new capital.

More important, however, than the direct effects of the decision will be its indirect effects. The securities of American railways were beginning to be regarded with suspicion by investors all over the world. A feeling had begun to develop that regulation of rates in this country meant merely preventing advances or causing reductions in them. It was obvious that if expenses continued to increase and rates continued to stand still or go down it was but a matter of time until American railway securities would become a very bad investment. By its decision the Interstate Commerce Commission has shown in the most conclusive manner its recognition of the fact that it is as much its function to protect and help the railways when they need and deserve it as to restrain and punish them when they deserve these things.

The increases granted in the east may probably be regarded as the forerunner of advances which will be granted to the western trunk lines. On the whole, therefore, the decision should cause a vast improvement in the sentiment of the investing public regarding our railway securities and improve the market for them. Whatever enables the railways to raise more money will enable them to spend more, and whatever enables the railways to spend more will enable them to employ more labor and buy more supplies, and should exert a stimulating effect on business of all kinds.

The greatest danger with which the railways are confronted is one on which there has been little public comment as yet. This is that the advances in rates which have been granted, and others which may be granted, will be absorbed by advances in labor costs. Railway labor has been steadily increasing its demands ever since 1907, and it shows no disposition to desist from doing so. Railway labor, like other labor, should be paid reasonable wages, but it should not be allowed to secure unreasonable and wasteful conditions of employment or excessive wages. If every advance in rates is to be offset or more than offset by increases in the cost of labor there will be no increase in railway net earnings. The future demands of railway labor should be scrutinized by the public in the most careful manner, for upon the concessions made to labor will largely depend the most important future developments in the railway business.

IT IS NOW UP TO THE EASTERN RAILROADS

THE decision of the Interstate Commerce Commission in the eastern rate advance case is important, not only because it will increase the revenues of the railways directly affected, but also because it indicates a disposition on the part of the commission to vigorously help the railways of the country generally to get whatever increases in earnings they may need. In one way this reduces the burdens and responsibilities of railway managers. Their inability to increase their revenues in proportion to the advances in their expenses was rapidly bringing them face to face with an impossible situation. In another way the decision greatly increases the responsibility of railway managers. It is most important that this point should be emphasized.

The managers of the railways went before the commission and said that they needed an advance in freight rates. This advance, they said, was essential in order that they might increase their net earnings. The increase in their net earnings was essential in order that they might raise and maintain their credit, and make the increases and improvements in their facilities which the interests of the public demanded that they should make. This was the argument the railway managers presented in 1910; it was their argument in 1913; it was their argument in 1914.

In the original rate advance cases the commission held that the railways did not need larger net earnings. In the 1913 case, which was decided in July, 1914, it held that the eastern lines did need larger net earnings, but found that it would be best that they should secure most of them by means other than a horizontal advance in their freight rates. The railways returned to the attack. Developments, they said, had shown that the need for an increase in their net earnings was important and pressing, while the working out of the various reforms in their ratemaking and service, which the commission had suggested, would take much time. Therefore the commission ought to give the eastern lines at once the horizontal increase in freight rates for which they asked and let the working out of the reforms which it had suggested follow after. The commission in its latest decision has in the main acquiesced in this policy. It has given the roads most of the increases in freight rates for which they originally asked. It has allowed them to make advances in passenger rates for which they did not originally ask.

The railways, by the line of argument which they have adopted in order to get the advances in rates which they have now secured, have given hostages to fortune. They have committed themselves beyond recall. Not merely by implication, but in the most express terms they have bound themselves in honor to do certain things. They have pledged themselves to the commission and they have pledged themselves to the public. It is now strictly up to them to make good. If they do not make good they will deservedly sacrifice the confidence of the commission and the public.

In the first place the roads have morally obligated themselves loyally to cooperate with the commission in eliminating the inconsistencies and unfair discriminations in their present services and rates. Chairman Harlan was amply justified in saying in his dissenting opinion that many such inconsistencies and discriminations exist. It is to the interest of the railways and the public that these things shall be remedied. They cannot be remedied without one railway sacrificing something here, and another sacrificing something there. They cannot be remedied without taking from some shippers improper favors of which they have been the recipients, and imposing on other shippers burdens from which they have escaped in the past, but which in fairness they should be made to bear.

Already there has been manifested a disposition on the part of some railway managers to refuse to do some of the things that ought to be done. The big shippers are always on the job and, unfortunately, there are many railway men who lack the strength of character or the brains to resist them and act squarely and intelligently. The entire railway situation ought not to be allowed to be compromised and imperiled by the weak or unscrupulous few. The commission has done the square thing by the railways. It is now up to the railways to do the square thing by the commission, the public and themselves.

To be specific it is up to them to eliminate from their tariffs the discriminations which every one knows they contain, whether taking the form of services or rates. It is up to them, for example, to eliminate such rates as the one the Wabash and the Chicago & Alton are now making on packing house products between Kansas City and Chicago. How can the managements of these roads face the commission with positions for any advance in rates when they voluntarily keep in effect such a rate?

Again, the eastern roads are in honor bound, in view of the estimony and arguments presented on their behalf in this case, .o use the additional resources which the decision will give them in the most careful and efficient way for the improvement and enlargement of their facilities. In other words, they are bound to use them for railroad rather than for financial purposes; and when we say "financial purposes" we have in mind such use of railway earnings and credit as was made by Mr. Mellen in New England. The public and the commission expect, in view of what the spokesmen of the railways said in the hearings in the rate advance case, that the additional earnings of the railways and the additional funds which these additional earnings will enable them to raise, will be spent upon the physical properties, and that these expenditures will be made, and that the properties will be operated, as economically and efficiently as human frailty and human ability will permit. The public and commission have shown a willingness to permit the railways to increase their net earnings by increasing their rates, but this has been on condition that the best use possible would be made of the additional revenue, and if the railways are to keep and deserve the confidence of the public and the commission they must meet this condition.

The railway managers have, in effect, conceded that they are quasi-public officials performing a quasi-public duty. To their stockholders they owe the duty of earning for them reasonable returns, by which are meant returns sufficient to get adequate capital invested in the railway business. To the public they owe, and have admitted that they owe, the duty of not only operating the properties as efficiently and economically as possible, but of raising capital as economically and spending it as efficiently as possible, and, since they have voluntarily recognized that they owe this duty to the public, it is strictly up to them to perform it.

Most of the managers of the railways feel, concede and are fully prepared to live up to, their duties and responsibilities in respect to the matters mentioned, and this, not merely as a matter of policy, but also as a matter of principle. Others, we fear, admit their public duties and responsibilities less as a matter of principle than as a matter of policy. Some do not admit them either as a matter of expediency or as a matter of principle. The future of the railways of this country depends chiefly on whether the first-named class of railway managers—and under this heading we include railway financiers—will or will not prevail in the counsels of the railways.

UNION PACIFIC

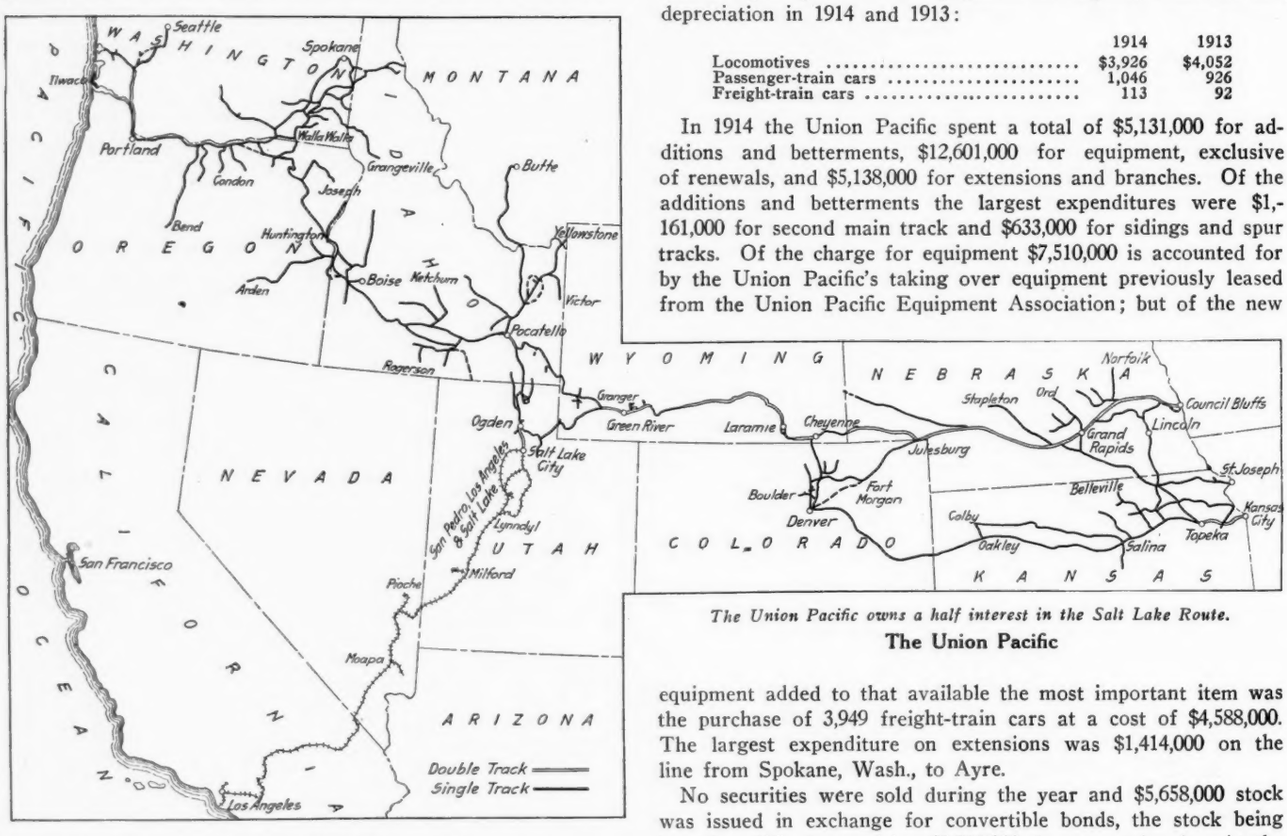
THE Union Pacific finished the fiscal year, ended June 30, 1914, with a surplus available for dividends of $33,094,000, or about 10 per cent less than the surplus available for dividends in the previous year. Revenue amounted to $92,115,000, 1.6 per cent less than in 1913, and the decrease is accounted for entirely by a shorter average haul. Expenses amounted to $55,410,000, an increase of 2.6 per cent, accounted for entirely by increased charges for maintenance of equipment and increased traffic and general expenses. The increase in traffic and general expenses was the direct result of the separation of the Southern Pacific and Union Pacific, which necessitated the establishment of separate traffic agencies and general offices.

Transportation expenses in the fiscal year 1914 amounted to $25,326,000, a decrease of 2.9 per cent as compared with the previous year. This decrease in transportation expenses is de-

spite an increase in mileage operated of 248 miles, the average in 1914 being 7,597 miles, and despite also a shorter average haul, which, of course, may or may not have affected transportation expenses, and despite a smaller average trainload, the trainload in 1914 being 431 tons, as against 437 tons in the previous year.

The Union Pacific's operating statistics illustrate how deceptive an average revenue trainload may be as a sole test of operating efficiency under certain circumstances. Whereas the revenue trainload decreased by 1½ per cent, and the trainload, including company freight, by 1 per cent, the average gross tons per freight-train mile, including cars and contents, were 1,242 in 1914 as against 1,203 in 1913, an increase of 3.2 per cent, and the gross tons per freight-locomotive mile were 1,092 in 1914, an increase of 3.8 per cent.

This gain in tonnage handled behind the drawbar by freight locomotives is particularly interesting, since by far the greater part of the saving made in transportation expenses was in the cost of fuel. Fuel for road locomotives in 1914 cost $6,856,000, which is less by 8 per cent than the cost in 1913, and fuel for yard locomotives cost 7.2 per cent less than in 1913. Total locomotive mileage in 1914 was 39,618,000, or 1.9 per cent greater than in 1913. Fuel coal cost $2.04 per ton in 1914 as against $2.11 in 1913. This is a saving of 7 cents; but far more important is the increase in miles run per ton of coal. In 1914 miles run per ton of coal was 10.52; in 1913, 9.75, an increase in miles run per ton of coal of nearly 8 per cent.



The Union Pacific owns a half interest in the Salt Lake Route.

The Union Pacific

Of the total tonnage carried in 1914, amounting to 24,812,000 tons, 7,656,000 was inter-system freight, which is the materials and supplies carried by one line for another and materials and supplies used in construction of extensions, etc. Of the remaining 17,155,000 tons, 29.83 per cent was products of mines, 29.45 per cent products of agriculture, 16.76 per cent products of forests, 11.10 per cent manufactures, 5.82 per cent products of animals and 5.13 per cent merchandise. As has already been mentioned, the tonnage carried increased by 3.72 per cent, the principal changes being a decrease of 9.12 per cent in the tonnage of manufactures and 3.93 per cent in livestock and animal products, with an increase of 10.76 per cent in forest products, of 9.66 per cent in products of agriculture and of 2.56 per cent in merchandise.

The Union Pacific's annual report presents maintenance of way figures in an exceptionally clear and comprehensive manner. On the same page in which the primary accounts under maintenance of way are shown for 1914 and 1913 there are also shown average miles of first and additional track operated, and amounts of material used in maintenance and the mileage of each class of weight of rail in track at the end of the year. The average cost of maintenance per track-mile, excluding sidings, was $1,251 in 1914, a decrease of 3.4 per cent. In 1914 2.34 per cent of all rails in the main track was renewed as against 2.95 per cent in the previous year, and 7.46 per cent of all ties, including ties in sidetracks, was renewed in 1914 as against 7.78 per cent in 1913. It is interesting to note that in 1914 $376,000 was spent for maintenance of signals, telegraph and power lines, an increase over 1913 of $150,000, or over 66 per cent.

Maintenance of equipment amounted to $12,123,000, an increase over 1913 of 13.4 per cent. The following table shows the amount spent per unit of equipment for repairs, renewals and depreciation in 1914 and 1913:

	1914	1913
Locomotives	$3,926	$4,052
Passenger-train cars	1,046	926
Freight-train cars	113	92

In 1914 the Union Pacific spent a total of $5,131,000 for additions and betterments, $12,601,000 for equipment, exclusive of renewals, and $5,138,000 for extensions and branches. Of the additions and betterments the largest expenditures were $1,161,000 for second main track and $633,000 for sidings and spur tracks. Of the charge for equipment $7,510,000 is accounted for by the Union Pacific's taking over equipment previously leased from the Union Pacific Equipment Association; but of the new equipment added to that available the most important item was the purchase of 3,949 freight-train cars at a cost of $4,588,000. The largest expenditure on extensions was $1,414,000 on the line from Spokane, Wash., to Ayre.

No securities were sold during the year and $5,658,000 stock was issued in exchange for convertible bonds, the stock being issued at 175, thus retiring $9,901,000 4 per cent bonds. At the end of the year the company had on hand $10,862,000 cash as against $11,855,000 at the beginning of the year. Total working liabilities amounted to $20,772,000.

The transactions growing out of the disposal of Southern Pacific stock were quite fully described and commented on in these columns at the time the events took place, but a very brief résumé of what was done properly belongs with the comments on this year's annual report. It will be recalled that the Pennsylvania took a part of this Southern Pacific stock, paying for it in Baltimore & Ohio common and preferred stock. An extra dividend was declared on Union Pacific common stock, consisting of $12 Baltimore & Ohio preferred, $22.50 Baltimore & Ohio common and $3 cash on each share of Union Pacific common. The stockholder who kept his Baltimore & Ohio and invested his cash at 6 per cent would get a yield of $2.01 on the dividend that came to him with each share of Union Pacific com-

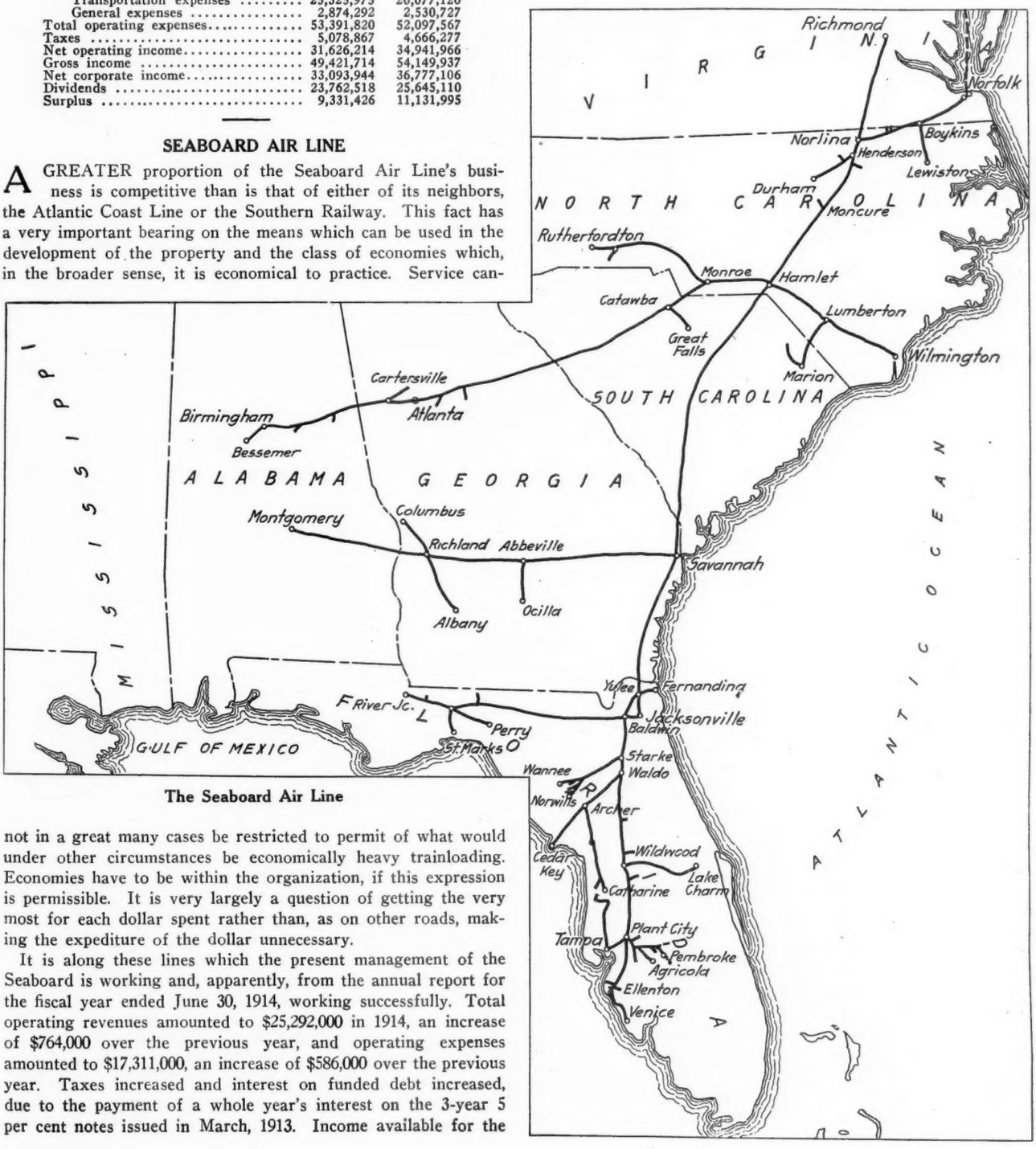
mon; in other words, the yield on what he got would be equivalent to 2 per cent on his holdings of Union Pacific common. The Union Pacific common dividend, which had been at the rate of 10 per cent, was reduced to 8 per cent. The extra dividend was, of course, charged to surplus and resulted in a writing down of profit and loss of $74,020,000. At the end of 1914 there was $90,586,000 credit to profit and loss after the transactions mentioned above.

The following table shows the principal figures for operation in 1914 as compared with 1913:

	1914	1913
Average mileage operated	7,597	7,349
Freight revenue	$62,434,292	$63,773,804
Passenger revenue	20,525,234	20,582,427
Total operating revenue	90,308,752	91,810,307
Maint. of way and structures	10,785,783	10,688,564
Maint. of equipment	12,123,174	10,694,011
Traffic expenses	2,282,596	2,107,146
Transportation expenses	25,325,975	26,077,120
General expenses	2,874,292	2,530,727
Total operating expenses	53,391,820	52,097,567
Taxes	5,078,867	4,666,277
Net operating income	31,626,214	34,941,966
Gross income	49,421,714	54,149,937
Net corporate income	33,093,944	36,777,106
Dividends	23,762,518	25,645,110
Surplus	9,331,426	11,131,995

SEABOARD AIR LINE

A GREATER proportion of the Seaboard Air Line's business is competitive than is that of either of its neighbors, the Atlantic Coast Line or the Southern Railway. This fact has a very important bearing on the means which can be used in the development of the property and the class of economies which, in the broader sense, it is economical to practice. Service can-



The Seaboard Air Line

not in a great many cases be restricted to permit of what would under other circumstances be economically heavy trainloading. Economies have to be within the organization, if this expression is permissible. It is very largely a question of getting the very most for each dollar spent rather than, as on other roads, making the expediture of the dollar unnecessary.

It is along these lines which the present management of the Seaboard is working and, apparently, from the annual report for the fiscal year ended June 30, 1914, working successfully. Total operating revenues amounted to $25,292,000 in 1914, an increase of $764,000 over the previous year, and operating expenses amounted to $17,311,000, an increase of $586,000 over the previous year. Taxes increased and interest on funded debt increased, due to the payment of a whole year's interest on the 3-year 5 per cent notes issued in March, 1913. Income available for the interest payment on the adjustment mortgage bonds amounted to $2,924,000, or about $60,000 less than the amount available the previous year. The adjustment bond interest calls for $1,250,000, so that the company had in 1914 $1,674,000 available for dividends on its preferred stock. A total of 3 per cent was paid in 1914, calling for $717,000.

The Seaboard Air Line operates 3,098 miles of line, of which 16 miles was added during the 1914 fiscal year. Its revenue freight density in 1914 was 511,000 tons one mile per mile of road, and its passenger density was 80,000 passenger miles per mile of road. The average receipts from freight per ton per mile were 1.099 cents, and per passenger per mile, 2.192 cents. Of the total 10,411,000 revenue tons carried in 1914, 33.37 per cent was furnished by manufactures and miscellaneous, 26.35 per cent by products of mines, 24.79 per cent by products of

forests—nearly a third of this tonnage is logs—and 14.30 per cent by products of agriculture, leaving 1.19 per cent furnished by products of animals. Phosphates and fertilizer form a very important part of the Seaboard Air Line's freight business. The tonnage of both these products showed a good gain in 1914 over 1913—phosphate, 1,027,000 tons as against 978,000 tons, and fertilizer, 994,000 tons as against 903,000 tons in the previous year. The only class of traffic in which there was any considerable falling off was in lumber and logs. In 1914 the road carried 1,515,000 tons of lumber as against 1,760,000 tons the year before, and 853,000 tons of logs as against 903,000 tons the year before.

Of course, since the beginning of the war there has been a large falling off in fertilizer traffic, and an almost corresponding falling off in phosphate traffic. This will be more fully discussed later.

As previously mentioned, total operating expenses amounted to $17,311,000. The following table shows the percentage of each class of expense to total operating revenues in 1914 and 1913:

	1914.	1913.
Maint. of way and structures	12.23	12.29
Maint. of equipment	13.46	13.61
Traffic expenses	3.15	3.13
Transportation expenses	36.61	36.28
General expenses	3.00	2.88

An increase of $79,000 in maintenance of way expenses was due principally to more tie renewals; an increase of $66,000 in maintenance of equipment was due to more equipment to maintain and a greater mileage of equipment; an increase of $359,000 in transportation expenses was due to a greater mileage run in passenger service, increases in the rates of pay of station agents and station labor, and larger charges for loss and damage to freight.

Despite the limiting condition of speed and frequency of service, the average freight-trainload was increased from 246 tons in 1913 to 263 tons in 1914; this is of revenue freight. The average freight-trainload of all freight was 299 tons in 1914, an increase of 23 tons over the average the year before. Thus, with an increase in the total ton mileage of 36,562,000, the total in 1914 being 1,575,000,000, there was a decrease in freight locomotive mileage of 184,000, the total in 1914 being 5,940,000.

The trainload on the Seaboard even in 1914 seems low if compared with many eastern or western roads, but is, however, considerably higher than that of the Atlantic Coast line, which was in 1914 225 tons (revenue freight). That it is not larger is in part due to the small proportion of coal tonnage carried and the large proportion of manufactures and of products of agriculture. The fact that manufactures is competitive traffic necessitates a fast schedule in this service; a large part of the products of agriculture is perishable and also demands a fast schedule with comparatively light loading. On the other hand the Seaboard has heavy grades, which are a limiting factor at present in trainloading on certain classes of traffic. This is a condition which can be bettered by the introduction of heavier engines. In 1914 the company received 35 Pacific type freight locomotives and is now receiving some Mikado engines. When these new locomotives are placed in service and a system of establishing points where tonnage rating of trains can be filled out from drag freight is completed, the average trainload of the Seaboard will be very considerably increased. The present year, of course, may not show the effects of this because of other extraordinary conditions. The company is also receiving some Mountain type locomotives for passenger service.

The Seaboard is in shape, in respect to its track and bridges, to handle the heavier engines without any expenditures for betterment. The program of bridge improvement which was completed about June, 1912, provided a minimum bridge capacity of Cooper E 50 loading on the lines north of Florida. In 1914 $1,854,000 was spent for additions and betterments and extensions, the principal expenditures being $415,000 for additional weight of rail, $249,000 for grading, $174,000 for ballasting unballasted track, and $169,000 for station buildings. Previous to 1913 the standard weight of rail in main track was 75-lb. In 1913 130 miles of 85-lb. rail was laid, and in 1914 144 miles. At the end of the year 1,208 miles of track was laid with 75-lb. rail. The present standard is to use 90-lb. rail on lines north of Jacksonville, Fla., and Birmingham, Ala.

The line between Hamlet, N. C., and Norlina is that of greatest density, and eventually this will have to be double-tracked, although with the heavier locomotives now being put in service it has by no means as yet reached the limit of its capacity as a single-track line. The freight density on this line is now in the neighborhood of 1,500,000 ton-miles per mile.

One thing which is being done in the development of the Seaboard, which is of great importance in the long run but is not immediately neglected in the figures in its annual report, is the working out of a more compact organization.

In the organization of most railroads operating from 3,000 to 4,000 miles of line, the officer directly in charge of the operation of the road is either a general manager or a vice-president in charge of operation. In the Seaboard's organization, as now worked out, the president is directly responsible for the operation of the road and the officer directly in charge is the general superintendent. This places a heavy burden on the president, even when, as in the case of the Seaboard Air Line, he is aided by two assistants, one an engineer and the other an operating man. If, however, the president is capable of bearing this burden and has the right kind of general superintendent, this makes a practical and very effective form of organization.

The present year, that is, the 1915 fiscal year, bids fair to be a rather trying one for the Seaboard, with consequent enforced economies; but this fact in itself is being utilized to perfect the organization. As yet the cotton tonnage has not moved to any great extent, and although cotton tonnage is not a large proportion of the Seaboard's traffic, the curtailment in the buying power of the planters has a quite marked effect on manufactures and merchandise. This also affects the fertilizer business.

A falling off in fertilizer traffic would reduce the Seaboard's tonnage of revenue freight to an appreciable amount and even more seriously affect revenue. The nitrate contained in fertilizer comes from South America and the potash from Germany, and there was some fear that the supply of potash might be seriously interfered with. At present, however, the supply of raw materials is thought to be ample, but the real difficulty is to be found in the diminished purchasing power of the cotton planters. If they are not able to buy fertilizer or secure it on credit the Seaboard will, of course, lose profitable tonnage by just that much.

The Seaboard Air Line has no loans and bills payable, and had, as of June 30, $2,700,000 total working liabilities, with $3,089,000 cash. Its only short-term obligations are $6,935,000 outstanding equipment trust certificates, maturing periodically, and the $6,000,000 3-year notes previously mentioned, which mature in March, 1916.

The following table shows the principal figures for operation in 1914 and 1913:

	1914.	1913.
Average mileage operated	3,084	.....
Freight revenue	$17,307,034	$16,788,112
Passenger revenue	5,430,531	5,221,200
Total operating revenue	25,291,758	24,527,865
Maint. of way and structures	3,094,200	3,014,957
Maint. of equipment	3,404,471	3,338,542
Traffic expenses	796,755	765,763
Transportation expenses	9,258,623	8,899,267
General expenses	757,346	707,085
Total operating expenses	17,311,395	16,925,613
Taxes	999,000	956,000
Operating income	6,961,003	6,819,938
Gross income	7,259,999	7,040,002
Net income	2,924,216	2,985,854
Interest on adjustment mortgage bonds	1,250,000	1,250,000
Dividends	716,823	.....
Surplus	649,268	1,467,933

The Decision Granting the Five Per Cent Rate Advance

Full Text of the Majority Opinion and Dissenting Opinions of Chairman Harlan and Commissioner Clements

The following is the opinion of the Interstate Commerce Commission which was handed down on December 18, in the rehearing of the five per cent rate advance case.

By the Commission:

These cases were originally submitted in May, 1914, and decided under date of July 29, 1914, 31 I. C. C., 351. Upon petition of the carriers filed September 15 the commission, on September 19, 1914, ordered—

That further hearing in said cases be, and is hereby, granted; said hearing to be limited to presentation of facts disclosed and occurrences originating subsequently to the date upon which the records previously made in these cases were closed.

Under these limitations hearing was had before the commission continuously for five days, ending October 23, 1914. Evidence was introduced by carriers, investment bankers and various protestants. Some of the exhibits supplemented those offered at the original hearing. The cases were argued before the commission on October 29 and 30, and thereupon submitted.

It is not necessary to make any extended summary of the conclusions contained in the commission's original report. report. Among other things it found that—

In view of a tendency toward a diminishing net operating income, as shown by the facts described, we are of opinion that the net operating income of the railroads in official classification territory, taken as a whole, is smaller than is demanded in the interests of both the general public and the railroads; and it is our duty and our purpose to aid, so far as we legally may, in the solution of the problem as to the course that the carriers may pursue to meet the situation.

The commission did not acquiesce in the carriers' proposal of a general increase as indicated in the tariffs filed by them, but suggested various methods by which they might properly conserve their revenue (pp. 407-414). In central freight association territory, however, by reason of the low general level of rates there found to prevail and also by reason of the financial necessities of the carriers in that territory, intraterritorial increases of approximately five per cent were permitted except on certain articles, mainly heavy low-grade commodities. It was suggested in view of the modifications required in the tariffs that the central freight association lines might find it more desirable to undertake at once the tariff readjustment asserted by them to be necessary. Save as above indicated, the proposed increases were denied and the tariffs carrying them were ordered cancelled.

NEW ELEMENTS

The "facts disclosed and occurrences originating" subsequent to May 29, 1914, as presented at the further hearing may be summarized under three heads—first, completed returns for the fiscal year ending June 30, 1914, and returns for succeeding months; second, the war in Europe, and third, results of the original order.

When these cases were originally submitted, as also when the original report was prepared, the revenue and expenditure account for June, 1914, and the property investment account for that fiscal year, were not available, the war was unforeseen, and the results of our order were, of course, yet to come. Collectively they present a new situation.

The carriers offered further evidence of their financial condition during the fiscal year ending June 30, 1914, including returns for that year completed by addition of the revenue and expenditure account for the month of June and the capital investment account for the year. They also introduced revenue and expenditure accounts for the months of July and August of the current fiscal year. Reports to the commission for the month of September, 1914, have since made possible a similar statistical statement for that month also.

These figures serve to emphasize our previous finding of the need of carriers in official classification territory, taken as a whole, for increased net revenue.

For the fiscal year just ended the net operating revenues as shown by the carriers are lower than was estimated or anticipated when the original report was issued. Not since 1908 have the net operating revenues of the carriers been so low as in the fiscal year ending June last. In 1908, moreover, the property investment account of the carriers was $1,309,000,000 less than in this last fiscal year. The surplus for 1908, after deducting $102,000,000 paid in dividends, was $47,000,000, whereas for the last fiscal year the dividends paid, amounting to $118,000,000, drew on the accrued surplus to the extent of $8,200,000. Of this amount the New England roads contributed over $4,000,000.*

From whatever comparative standpoint viewed, the net operating revenues of the last fiscal year must be regarded as unduly low. Operating costs and operating revenues fail to show the tendency to such concomitant variation as should prevail in the transportation industry. While the gross revenue in that year declined only about 3.4 per cent, the net revenue shrank approximately 17.7 per cent as against the previous fiscal year. The indication is that some important items of cost have become relatively inelastic, and that a fall in gross revenue leaves an increasingly narrow margin of net revenue.

The situation is different when an attempt is made to estimate the decline in the rate of return. The property investment accounts as now standing on the books of the carriers can not be accepted as accurately representing the fair value of their property devoted to serving the public.

MAINTENANCE EXPENDITURES

Objection was raised to the increasing amounts charged in recent years to additions and betterments, particularly because the carriers in presenting a financial review of their operations for a series of years failed to indicate separately the relative effect upon their accounts of outlay for additions and betterments as compared with allowance for depreciation, it being contended that this caused an unwarranted diminution in the resulting net income from operation.

The fact nevertheless remains that if the increase in depreciation and betterment accounts in the last fiscal year over the average of similar allowances for the five-year period were added to their net operating income for the last fiscal year, the results of operation would still fall below a fair return upon the amounts carried upon the books as investment in property.

While there has been recently an enlarged expenditure for maintenance of equipment, it is clear that it has not been sufficient to restrict to proper limits the number of cars and locomotives needing repairs. The carriers in the past have not known how large an expenditure to figure upon for the maintenance of the newer type of steel freight cars, and appear now to have discovered that such expediture must be greater than was anticipated.

The like may be said as to the recent enlargement of expenditure upon roadway. We can not view with favor any attempt to obtain an increase in net revenue through unduly restricted expenditures upon maintenance.

To whatever extent recent increased provision for depreciation or expenditure for maintenance may militate against a fair comparison of supposedly comparable statistical items for various years, we can not say on this record that such charges as at

*NOTE.—It is not to be inferred from these figures that the total surplus in 1913-14 decreased by the amount of $8,200,000. From reports made by the carriers to this commission the appropriated surplus for class I roads, eastern district, was $343,508,201 on June 30. 1914. This was an increase over appropriated surplus existing on June 30, 1913, of $19,378,945. During the same year there was, however, a shrinkage in the excess of credit over debit balances to profit and loss of $53,957,233, indicating for the last fiscal year a shrinkage in total surplus of $34,578,288.

present returned by the carriers are excessive, viewed either from the standpoint of proper accounting or of safety of operation.

The testimony shows that while some maintenance is being deferred, other maintenance deferred during the last fiscal year is now being made, and that the expenditure therefor during the months of July and August measured up to the level of recent years. The testimony also shows that transportation expense is being reduced through the laying off of employees and cancellation of train service.

THE EFFECT OF THE WAR

It was urged on behalf of the carriers and the investment bankers who appeared at the hearing that the war in Europe has created a condition which renders the diminution of the carriers' net income a menace to the prosperity of the country; that the war has placed an added strain upon the credit of carriers; that rates of interest will rise; that a large volume of railroad securities is held abroad; that the denial of the increase in freight rates would, in view of the diminished net income, be followed by a dumping of foreign securities upon the American markets; that our markets would not be able to absorb these securities—at least, without great fall in price; that disaster would result not only to our railroads, but to insurance, banking and industrial concerns; and that for these and other reasons, extending far beyond the direct needs of the carriers themselves, we should now allow the proposed increase in rates.

With some of these considerations we have, as a commission, nothing to do. Our powers and functions are those, and only those, conferred by congress. As was said in Advances in Rates, Western Case, 20 I. C. C. 307, at page 317:

We must not regard too seriously, however, the effort of railroad counsel to establish this commission *in loco parentis* toward the railroads. We must be conscious in our consideration of these rate questions of their effect upon the policy of the railroads and, ultimately, upon the welfare of the state. This country can not afford to have poor railroads, insufficiently equipped, unsubstantially built, carelessly operated. We need the best of service. Our railroad management should be the most progressive. It should have wide latitude for experiment. It should have such encouragement as would attract the imagination of both the engineer and the investor. Nevertheless, it is likewise to be remembered that the government has not undertaken to become the directing mind in railroad management. We are not the managers of the railroads. And no matter what the revenue they may receive there can be no control placed by us upon its expenditure, no improvements directed, no economies enforced.

The conflict in Europe will doubtless create an unusual demand upon the world's loan fund of free capital, and may be expected to check the flow of foreign investment funds to American railroads. It appears that our railroads represent the bulk of European investment in this country. The rate of interest—the hire of capital—has risen during the last decade, and may rise still further. It is computed that in the years 1915, 1916 and 1917 the carriers in official classification territory must arrange for the payment or refunding of securities aggregating over $500,000,000. True, the representations of the carriers in the 1910 cases, that without the increases then sought their credit must totally vanish, proved strangely at variance with their subsequent experience in the borrowing of many hundreds of millions. But we do not doubt that the financial problems of the carriers have been made much more acute by reason of the war, and if we are to set rates that will afford reasonable remuneration to these carriers, we must give consideration to the increased hire of capital as well as to other increased costs.

The suggestions made in our original report of methods whereby to increase net revenue were not susceptible of being put into immediate operation or calculated to produce immediate financial results. This was recognized in our original report. The period which has since elapsed has, of course, been entirely too short for either purpose. Some testimony was offered at the further hearing bearing on what had been done or undertaken in line with these suggestions, and estimates were made by the traffic officials of several carriers as to the annual yield to be expected. These estimates were not based on any accounting computation and can afford little guide as to what the results will prove to be.

THE CONCLUSION

While we differ as to the relative importance to be attached to the various considerations presented, we agree in the conclusion that, by virtue of the conditions obtaining at present, it is necessary that the carriers' revenues be supplemented by increases throughout official classification territory. Whatever the consequences of the war may prove to be, we must recognize the fact that it exists, the fact that it is a calamity without precedent, and the fact that by it the commerce of the world has been disarranged and thrown into confusion. The means of transportation are fundamental and indispensable agencies in our industrial life and for the common weal should be kept abreast of public requirements.

The original report, besides approving a rate increase in central freight association territory, suggested 10 sources of additional revenue for all carriers throughout official classification territory; the present report, recognizing the existence of a new situation since July 29, acquiesces in a territorial extension of the relief granted to the central freight association lines by permitting the carriers to file tariffs providing, with certain exceptions specified herein, for horizontal rate increases in official classification territory. It is expected that the constructive work suggested in the original report for the purpose of conserving and augmenting the net revenues of the carriers generally will be carried forward without interruption.

Carriers will be required to keep an account of the additions to their revenues from increases in rates subsequent to July 29, 1914, and from new charges, and to report separately thereon

Sykes in the Philadelphia Ledger

To Him Who Hath——

to the commission at the end of 12 and 24 months, respectively.

For various reasons we shall except from the proposed increase the following rates:

1. Rail-lake-and-rail, lake-and-rail and rail-and-lake rates. It is shown on the record that since the rail carriers acquired ownership and control of the lake lines successive increases have been made in the rates via lake tending to lessen the differences between them and the all-rail rates.

2. Rates on bituminous coal and coke. Not long since these rates were investigated and maximum rates were prescribed by the Commission. The key rates upon bituminous coal—the rate from the Pittsburgh district to Youngstown, and the rate on lake cargo coal to Ashtabula—have been fixed in the light of the various factors which enter into the transportation of such coal. The prevailing rates are remunerative, and the financial condition of the principal bituminous coal carriers is in marked contrast with that of many of the other carriers in official classification territory. Twice in the not distant past the rates on bituminous coal have been increased 5 cents a ton, and would seem now to be as high as may fairly be allowed. It must be remembered also that the carriers are not seeking general increases in rates on anthracite coal, and both kinds of coal are used in competitive markets. As to coke, the rates controlling the greater volume of traffic now moving in official classification territory have recently been set by the Commission upon a basis which was specifically designed to guard against shrinking the carrier's revenue therefrom, and which really resulted in substantial additions to their earnings on that traffic.

Weed in the New York Tribune

The Lord Loveth a Cheerful Giver

3. Rates on anthracite coal and iron ore, largely because they are before us for review in other proceedings.

4. Rates held by unexpired orders of the Commission.

In our original report we declined, for reasons there stated, to allow increased rates in central freight association territory on cement, starch, brick, tile, clay and plaster. On further consideration, in the light of the existing situation, these rates may be increased throughout official classification territory under the limitations herein set forth.

Joint rates between official classification territory on the one hand, and southeastern territory, the southwest and points on or east of the Missouri river on the other, may be increased not to exceed 5 per cent of the division of the rate accruing to the carriers in official classification territory. If these increases involve a change in the relationship under the long-and-short-haul rule between intermediate points and more distant points outside of official classification territory, relief from the fourth section of the act must first be secured on regular application.

Interstate rates to and from New England from and to points in trunk line or central freight association territory, where necessary to preserve established relationships between points or ports in New England and points or ports in trunk line territory, may be increased not to exceed 5 per cent.

Subject to the maintenance of the established Atlantic port differentials, rates to and from New York may be increased not to exceed 5 per cent, and rates to and from Portland, Boston, Philadelphia and Baltimore may be increased to the extent necessary to maintain said differentials.

Except as otherwise above specified rates in official classification territory may be increased by not more than 5 per cent; but rates increased since July 29, 1914, may not now be again increased so as to exceed those then in effect by an aggregate of more than 5 per cent of the intraterritorial rate, or of the portion or division of the interterritorial rate accruing to the road or roads in official classification territory, as the case may be.

If fractions in excess of one-half a mill are rounded upward, fractions less than one-half a mill are to be discarded.

In some instances, and in part because of the pendency of this proceeding, we have recently suspended proposed increased rates in this territory. Carriers may, if they so elect, now cancel such tariffs so suspended and file in lieu thereof tariffs which conform to the limitations above specified. If that is done such suspensions will be vacated.

To the extent above indicated we now modify our previous finding, and carriers affected may file, effective on not less than 10 days' notice, such tariffs as do not offend against the restrictions above stated.

DISSENTING OPINIONS

Chairman Harlan:

The further hearing of this case added nothing substantial to the relevant facts before us when the original report was handed down. It served only to confirm the soundness of the finding then made that the railroads in official classification territory, taken as a whole, ought to have additional net income. My own view of the record has been and is that the carriers in that territory, considered collectively, are in need of more additional net income than the amount, $50,000,000, which they estimated the proposed 5 per cent increase in rates would yield. I can readily agree, therefore, to the reiteration in the supplemental report of the finding of the original report that those railroads need additional revenues; and to that extent what is here said may be regarded as a concurrence. I wholly dissent, however, from the course now approved by the Commission for permitting the carriers to augment their revenues.

The original record contained evidence that the general rate basis in central freight association territory was unduly low and that the proposed increased rates would be just and reasonable. We therefore allowed the higher rates, with certain exceptions, to go into effect. The original record contained no evidence tending to prove that any of the proposed increased rates affecting trunk line or New England territories were just and reasonable, and this deficiency in proof was not supplied upon the further hearing. For example, the 75-cent rate on first class traffic moving between New York and Chicago is the rate yardstick of this country, the standard by which, after making due allowances for differences in conditions, density, etc., all other

rates may ultimately be measured. That scale of rates has been in effect for more than a generation. Nevertheless, no effort was made on the part of any of the lines in official classification territory to show by what may be denominated rate testimony that this scale of through rates is unduly low or that higher through rates would be just and reasonable. Since the act of Congress imposes the burden of proof upon the carriers to establish that proposed increased rates are just and reasonable, we were compelled to withhold on the original hearing and are, in my opinion, now bound to withhold approval of any of these rate increases affecting trunk line and New England territories. Moreover, the record shows the financial condition of the trunk line carriers generally to be much more favorable.

We pointed out, however, in our original report the sources from which the needed additional net income could and should be obtained—namely, by a revision of rates and an abandonment of practices found to be unremunerative or wasteful. The beneficent effect of an intelligent revision of rates is shown by the results obtained in New England while this proceeding was pending. The New England carriers sought approval in this case of an increase only in the rates on traffic moving between that territory and other parts of official classification territory; they did not propose a general 5 per cent increase in their freight rates. Those carriers undertook instead a general rate revision, which has since been largely effected through friendly conferences with state commissions and with shippers and is now, by common consent of the shipping public and state officials, being brought to a conclusion on a basis that will afford those lines much larger additional net income than they could have secured through a 5 per cent increase in their freight rates. In other words, the New England lines have voluntarily pursued the only rational and reasonable course to augment their revenues, this being the course urged upon the central freight association lines in our original report, and the course that those lines at the hearing admitted to be necessary in order to meet their real requirements. As a matter of fact, as pointed out in the original report, the central freight association lines joined in the application for a horizontal 5 per cent increase in their rates only because of the desire of other and more powerful lines operating in trunk line territory to present to us in this proceeding one general plan of relief.

The record shows that there are many unremunerative rates and unremunerative practices now in effect throughout the official classification territory; that a very substantial amount of service is performed without any charge whatever; and that undue burdens are cast upon the carriers through various influences. We have had in this proceeding an opportunity to learn also to what extent and with what effect on their revenues abuses exist among the railroads because of the treatment of one by the other in competing for traffic. The abandonment of remunerative and wasteful practices involves among other things the elimination of the free services and excessively low rates which represent, in very many instances, the price a carrier pays for the large tonnage of influential shippers and result in making the carrier bear the geographic disadvantages of individual shippers and expenses properly a part of their manufacturing costs. The elimination of the preferences created by these means would give to the carriers very largely increased earnings and at the same time properly distribute the necessary burdens of transportation, so that those who get the service shall pay for it. By following the suggestions made in the original report the carriers could undoubtedly secure more additional net income than the amount estimated to accrue under the proposed horizontal rate increase, and far more than can accrue to them under the relief now accorded in the supplemental report.

HOW THE COMMISSION CAN HELP

At the further hearing the carriers earnestly contended that their necessities were so urgent that they could not await an increase of revenues from those sources. Relief, however, could be had immediately if the Commission would refrain from a too free use of its power to suspend increases in rates pending investigation. This power is exercised, in my judgment, with unnecessary frequency, in view of the opportunity that shippers have of testing the reasonableness of increased rates upon formal complaint filed with the Commission; and, in my judgment, the Congress never intended so free a use of it when the power to suspend was granted to us. It was pointed out also by the carriers that the states were interfering, both by restricting rates and by imposing heavy burdens upon interstate carriers in the form of full-crew and other similar laws. To overcome these various influences that deplete the revenues of the carriers and interfere so largely with their prosperity, the mere statement of the facts by the Commission is not enough. In times of financial strain and stress other industries must, by introspection and self-examination, see how their methods may be improved. The original report requires a similar course on the part of the carriers; and what is needed is the most persistent affirmative course of action on the part of the Commission, not only in requiring,

Nelson Harding in the Brooklyn Eagle

Better Late Than Never

but in aiding the carriers to eliminate such abuses from their rate structures and practices.

The supplemental report, in seemingly relieving the carriers' distress, removes the spur of obvious necessity which would have been the most potent factor in eliminating the abuses which the record shows are the real cause of the existing inadequacy of revenue. The inevitable result of the Commission's action will be to remove the pressure which otherwise would exist upon the state authorities to apply the right remedies. The supplemental report unlawfully shifts the burden of the carriers' troubles upon the interstate shipper. This should frankly be recognized as one of the results that will follow the action now approved by the majority of the Commission. An endeavor to stimulate commerce and to bolster up the credit of the carriers, as contended at the further hearing, by an increase in rates, will simply result in a perpetuation or recurrence of the financial distress of the carriers.

CONCLUSIONS

I cannot but think that a general increase in the standard rates of this country, while the rate structures of these carriers remain full of inconsistencies, discriminations and wrongful practices that deplete their revenues, is morally wrong; that the placing of additional burdens on interstate commerce that is not also placed upon state commerce, is also wrong; and that the course approved in the supplemental report will ultimately be as disastrous to the carriers themselves as it will be harmful to the general interests.

The original report was announced on July 29, 1914. Two days later the great European powers were suddenly thrown into a state of war. The immediate effect upon the commerce of the world and upon the commerce of this country is known to all and need not be described here. The results of that conflict, which is unparalleled in recorded history, are accepted in part by the Commission as the basis for the action it proposes in the supplemental report. Just how long the war may continue no one can conjecture. To what extent it may impair and impede our general prosperity and commerce cannot be predicted. Both undoubtedly are seriously menaced by its further continuance; and on these grounds we were urged at the further hearing to grant immediate relief. The objection was made that in deciding the general rate questions before us, we have no right to be governed by conditions presumably temporary in their nature, like those incident to the war, nor to consider the attending effects on general business and prosperity in this country of the allowance or denial of the proposed rate increases.

Aside from this objection to our legal right and power, which perhaps should be regarded as conclusive, there are grave doubts whether the facts assumed by the carriers, bankers and others at the further hearing are being verified by the progress of events. The apprehension of the bankers and others, most strenuously urged at the further hearing as a reason for granting increased rates at once, was that otherwise our railroad securities held abroad would, in consequence of the war, be dumped upon our markets with disastrous results, not only to the railroads, but to business interests generally. This apprehension the bankers apparently have concluded to have been so clearly unfounded that, in advance of any decision by the Commission upon the carriers' contentions at the further hearing, the great financial interests in control of such matters have not only caused the stock exchanges, which were closed at the beginning of the war, to be reopened, but have now caused the removal of all restrictions upon trading in such securities, the minimum-price limitation having been withdrawn. It also appears from public sources that since the further hearing interest rates, instead of increasing, as confidently predicted by the experts who then testified, have shown a downward tendency, and since the date of the original report the average operating ratios of the lines in official classification territory have shown a marked improvement. If at any time hereafter it should definitely appear that the carriers require immediate temporary relief by reason of the war and its effects, it could be obtained by a refiling of the tariffs heretofore disapproved, and in that event I should have no difficulty in regarding it as a proper exercise of our discretion under the act to decline to suspend them pending investigation.

LIMITATIONS OF THE POWER OF THE COMMISSION

Commissioner Clements, dissenting:

I can but regard the action now taken by the Commission as out of harmony with the spirit and purpose of the law, and as taking a step that leads away from the sound principles necessary to conserve the ends of justice.

Carriers have a right to earn all they can on the business which they can secure at just and reasonable rates. The right of the shipper to protection against the exaction of rates unreasonably high for the service performed is equally sacred.

Upon our order of suspension and investigation of these rates, in my view, there is but one question lawfully before us for ultimate determination, and that is, are they "just and reasonable"? Upon this question the burden of proof is placed upon the carriers by the statute. Have they met the issue and discharged this burden? If they have done so, they are of right clearly entitled to have them go into effect. If they have not, it is with equal clearness the duty of the commission under the law to prevent their establishment.

As shown by our report of July 29, 1914, in this proceeding, we found upon comparison of the rates proposed in central freight association territory with rates in other territories, including trunk line territory, as well as by other ordinary tests of reasonableness, that the carriers had as to the former territory, with certain specified exceptions, met the burden and justified the proposed increases. In my view the foregoing report and decision constitute a new and radical departure and a most serious and portentous step, in that by this step the commission is shown to deem itself justified in sanctioning these increased rates in the latter territory upon consideration of general financial and operating results, without resorting to other ordinary tests or factors heretofore deemed pertinent and necessary to the determination of the reasonableness of rates. I am not aware of any prior case in which this commission or any court has held that the need by a carrier of money was of itself proof of the reasonableness of a specific rate, or body of rates, increased to meet such need. The commission has repeatedly held that the commercial necessities or interstate of a particular shipper, community, or kind of industry, considered alone, afford no basis for the reduction of rates, and that it cannot in any case reduce the same except upon an affirmative showing of unreasonableness, after full hearing. In any considerable group of carriers there are probably always some that are in need of more money than they earn, when such need is tested by their obligations without regard to the extent or manner of creating such obligations, or the disposition of the proceeds thereof. If the basis of the conclusions of the majority of the commission sanctioning these rates in trunk line territory is sound, and points to the rule of action for the future, the burden placed by the law upon the carriers to justify increases in rates is indeed made light and easy to carry, especially when by concerted action a group of carriers, some strong and some weak, simultaneously propose to increase the great body of their rates.

As I understand it, justification of the rates permitted by this decision to be increased rests largely upon the need of greater net revenue to enable the carriers to afford adequate service to the public, to meet their financial obligations, and maintain dividends in such manner as to encourage further investments in railways and their securities. If these considerations constitute a sufficient basis for wholesale approval of a body of increased rates agreed upon by all carriers in a given territory, competing or connecting, weak or strong, the same must be equally true if every road in the country, as well as every rate, were included in a proceeding before us.

If the legislative authority of the commission is as broad and unrestricted as this, then I must confess that I have gravely misunderstood the limitations upon our statutory authority, as well as the constitutional power of Congress to delegate its legislative power.

It may be said that the commission was not obliged by the law to suspend these rates when filed, and that those who must bear these increased burdens are in no worse situation, now that the rates once suspended are permitted to become effective, than if they had never been suspended. Such a suggestion, however, appears to ignore the true and important intent of that provision of the act of 1910, investing the commission with authority, when instituting an investigation as to the reasonableness and propriety of a proposed new schedule of rates, to suspend the operation thereof pending such investigation. As shown in the excerpt from our last annual report, hereinafter quoted, this act was passed in the face of the initial steps then being taken by these and other carriers for a general increase of rates. The steps taken by the President of the United States and the attorney-general at that time, as outlined, point with singular clearness to the intent and purpose of this provision for suspension. This purpose is made the more manifest, if possible, when considered in connection with the two other distinctly remedial provisions of the same act that go hand in hand with

it; these are the authority for the commission on its own motion to institute an inquiry to the same effect as in the case of complaint, and the definite rule of law placing the burden of proof upon carriers as to increases made, or proposed to be made, subsequent to January 1, 1910. The commission, in its annual report for the year 1912 indicated its understanding of the purposes of this suspension provision, and the manner of administering the same, as follows:

"In the exercise of its authority to suspend the operation of new tariff schedules the commission has not understood that it was the purpose of the provision of section 15 of the act of 1910 that, as a matter of course, all advances in rates should be suspended; but upon the contrary has proceeded upon the idea that it was the purpose of this provision that it should exercise sound discretion in these matters. Therefore, upon such preliminary consideration as it has been practicable to give, the commission has undertaken to distinguish between current changes in rates which might be regarded as natural and normal readjustments occurring in the ordinary course of business, and distinct and material advances for the definite purpose of increasing rates; and in the latter class of cases it has undertaken to scrutinize the apparent reasons therefor and has acted in the light of another provision of amended section 15, which casts upon the carriers the burden of justifying rates advanced after January 1, 1910." (Page 18.)

COURT POWER TO REVIEW

It may be true as a matter of fact that the commission could altogether refuse to suspend or, having suspended a body of proposed increased rates, however extensive in scope and large in amount, could subsequently vacate its order of suspension and permit them to go into effect, without such action being subject to judicial review. If so, is there not greater need for constantly keeping in mind the definite object of these provisions, because the shipper is without remedy elsewhere, if he should suffer by our failure to act properly in the administration thereof? Upon the other hand, if the commission makes an order against carriers which is shown to result either in confiscation or is beyond its statutory authority, not resting upon due process and full hearing with supporting testimony, the carriers may go to court and have it set aside.

If by modification of our former order in this proceeding, increased rates heretofore condemned are now permitted, what is the legal justification for this action unless based on ascertained reasonableness of these rates, according to the ordinary tests? Will the legal interpretation of this supplemental report and order be to the effect that these rates have been found reasonable by the commission? If so, whatever standard of reasonableness has been applied, is not the shipper bound by our action if hereafter he desires to challenge the reasonableness of these rates? Upon whom will the burden of proof then rest? Of what avail will these remedial provisions of the act of 1910 be to the shipper if this procedure, these grounds of action, and the results thereof are compatible with the requirements of the law as a whole?

Anyone familiar with the procedure necessary to be observed in making and enforcing a lawful order against a common carrier for the reduction of a particular rate, and what would be required as a proper record of full hearing and testimoney supporting an order requiring the reduction of the general body of the rates of each or all of the carriers in a large group or territory, must be struck with the facility with which rates may be increased as indicated by this decision.

Surely the fact that the commission's negative action is not ordinarily reviewable in court affords no justification for a different basis or test of the reasonableness of rates, in a situation like the present one, than would apply when the same question is before us on a complaint made by shippers seeking reductions in rates, unless the commission has been vested with broad legislative authority to inaugurate and shape public policy. While I do not mean to say that such authority is claimed by the commission, I can see no other basis for the action taken by it in this matter.

OVER CAPITALIZATION

The financial results of the carriers' operations, appearing and so much stressed in this case, are figured with important relation to the carriers' so-called "book value," or account of both actual and alleged investment, which accounts have long and generally been recognized as largely untrustworthy. These financial results are of course affected directly and materially by the bonds and other obligations, however and for whatever purpose issued. There is and has been no adequate control of the issuance of stocks and bonds, and they have been put out largely by those holding the theory that there exists no relationship between the securities of a carrier and the reasonableness of its rates. Now, we see these securities calling for increased rates to make them good.

If, now, to strengthen and maintain the credit of the carriers, regardless of the causes of its exhaustion or impairment, and without the application of the usual tests of reasonableness, these increases are justified, then, it seems to me that we are only at the beginning of what I fear will be a train of demoralizing results, disappointing and embarrassing to all concerned. It is by no means certain that it would not, in the long run, be cheaper to the public to guarantee the bonds of the weak roads unable to meet their obligations, rather than to try to take care of them by increased rates, which inure to the strong roads as well as the weak.

Up to the beginning of these efforts for increased rates there had for many years been a steady and constantly increasing percentage of carriers paying dividends, as well as in the rate of dividends paid. It appears evident that carriers are suffering more just now for want of freight to carry than for want of higher rates. It is just as safe to prophesy that this is a temporary condition as to prophesy concerning future rates of interest and the dumping of foreign-held American railway securities on our investment markets. It would not seem to be out of line with ordinary prudence and conservatism, prevailing in other lines of industry, if the carriers had undertaken to meet this apparently temporary situation as have others. Such a course, it seems to me, would have contributed to their credit, rather than the course they have pursued.

Pertinent at this point is the language of Commissioner Lane, in continuation of that in the foregoing report of the majority in this case, quoted from him in the 1910 Western advanced rate case. There, in quoting from the brief of the Atchison, Topeka & Santa Fe Railway Company, he said (20 I. C. C., 317):

"The full significance of the opening sentence quoted, 'that American railway rates never have been high enough and the public has never paid adequately for the service which it has received,' cannot be appreciated until one stops to think that for nearly seventy-five years after the first railroad was built the American Government did not choose to exercise the power of regulating the charges of interstate railroads. These carriers, charged with a public trust, were given a free hand in the institution of their own rates until within the last four years, and they now appear asking the protection of the law to increase their rates, which under the play of economic forces they say never have been high enough. Throughout this record it appears that a literary campaign has been conducted by the use of railroad money with the manifest purpose of establishing both at home and abroad the impression that the effect of railway regulation in the United States is injurious to the American railroad. Widespread circulation has been given to the pessimistic utterances of railroad financiers who sought to fix the idea that injustice was being done our railroads by restrictive and oppressive legislation. Yet it is apparent that the carriers at present in this and similar cases are relying upon the restrictive provisions of the law which declare concessions from the published rate to be criminal and thus give stability to rates—at least as between carriers—to permit the elevation of rates to a standard which under the force of competition the carriers were unable to reach and maintain."

This decision of the commission is the culmination of the concerted efforts of the respondent, and other carriers, for a general increase in freight rates, beginning in 1910.

AUTOMATIC SIGNALS ON THE LEHIGH & HUDSON RIVER

The Lehigh & Hudson River has installed automatic signals on 72 miles of its main line from Maybrook, N. Y., to Belvidere, N. J., practically the entire line. The track is fitted for high speeds and traffic is heavy, averaging 42 trains a day, of which 12 are scheduled passenger, 8 scheduled freight and 22 extra freight. The maximum traffic has run as high as 53 trains a day. When putting in automatic signals, train-order signals were changed from three to two-position, and now display but two indications, stop and proceed. The first automatic signal in the rear is controlled by a circuit running through a circuit breaker on the train order-signal and so serves as a distant for the train-order signal, indicating caution when the train-order signal is at stop.

The installation of automatic signals made it possible to

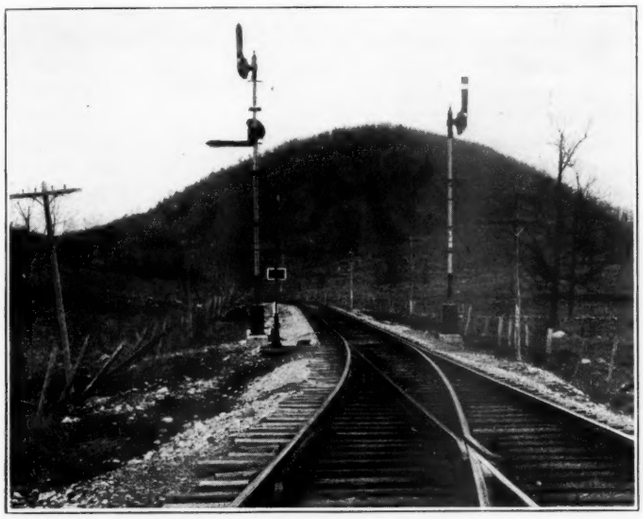


Fig. 1—Two-Arm Signal at Turnout

reduce the force of telegraph operators; five night offices were closed and seven operators were transferred to other duties. A further reduction in this force could have been made, but was not necessary, as the agents at regular stations serve as operators. Following the installation of automatic signals, Form "31" was discontinued and train orders are now given on Form 19 in all cases, and there is no stopping of trains for orders.

A typical arrangement of signals at and between passing sidings is shown in Fig. 3. These sidings, of which there are 22, are 3,000 to 3,300 ft. in length; they average 2½ miles apart. There is one lap siding, the signal arrangement for this location being shown in Fig. 4.

The signals and apparatus were installed by the General Railway Signal Company, arranged according to the "absolute-permissive" system; absolute blocking between passing sidings for opposing movements, and "stop-and-proceed" or standard double-track blocking, for following movements.

In Fig. 3 the thin lines indicate the control of each signal. Each passing siding has an entering and a leaving signal at each end for each direction, as shown in Figs. 1 and 3. Between passing sidings there are two or more intermediate signals for movements in the same direction, and the average distance between signals governing movements in the same direction is about 4,400 ft.

Ordinarily, entering signals are permissive or stop-and-proceed signals, of which 1 and 4 at siding A, Fig. 3, are typical. The control of signal 1 extends to the farther end of the first track circuit beyond signal 3, and likewise the control of signal 4 includes the first track circuit beyond signal 2. This arrangement insures that two trains approaching a meeting point will encounter stop-signals at the entrance to the sidings, in which case the inferior train prepares to enter the siding.

Each entering signal has a lower arm controlled by the position of the passing-siding switch. When this switch is set for main track, the lower arm is horizontal, but when set for the siding, the lower arm is at 45 deg. This arrangement eliminates unnecessary stops at meeting points. In all cases the outgoing signals are "stop-and-stay" signals. The control of a leaving signal extends to its respective opposing leaving signal at the siding in advance; for example, signal 10, Fig. 3, is controlled by the same track circuit as signal 3. Intermediate signals between sidings are stop-and-proceed, as before stated. For opposing movements, the control of these signals is lapped the same as their respective leaving signals, and for following movements the control is from signal to signal.

In the case of stop-and-proceed signals when they are located on ascending grades, where heavy trains would have diffi-

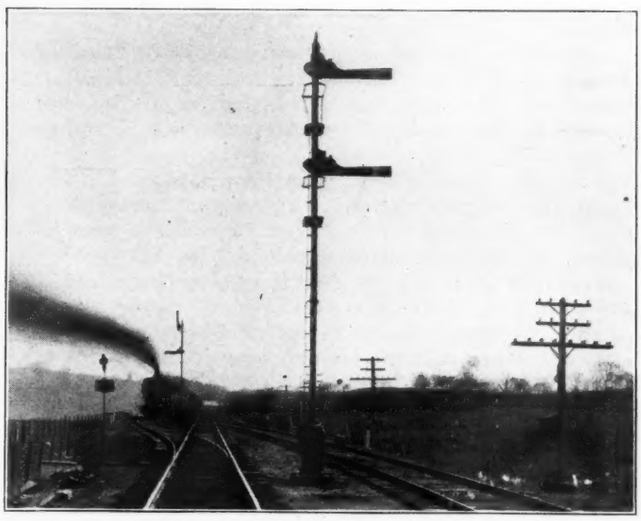


Fig. 2—At Lap Sidings

culty in starting, a full stop is not required. Two-arm signals, called "tonnage signals," are used; these permit a following train to enter an occupied block on a cautionary indication without coming to a stop. Since the speed of trains accepting this indication is necessarily slow, there is practically no sacrifice of safety and a considerable advantage in facility. At a "tonnage signal," when the upper arm is in the proceed position, the lower is horizontal. When the upper arm is at stop, the lower arm moves to the 45 deg. position, indicating "block is occupied, proceed with caution."

Prior to the signal installation the railway company com-

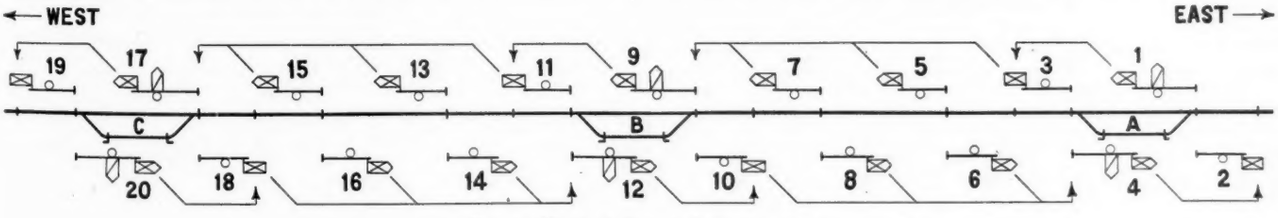


Fig. 3—Typical Signal Arrangement

pleted on the greater part of the road a new pole line consisting of 26 ft. chestnut poles, 7-in. top, 40 to the mile, with Washington fir cross-arms, ½-in. steel pins on single arms, 5/8-in. steel pins on double arms, single groove d. p. glass insulators and R. S. A. cross-arm braces and lag screws. The lower cross-arm supports the signal wires.

Line wires for the signaling circuits are No. 10 B. & S. gage, double-braid, weatherproof, 30 per cent copper clad. They are fastened to the insulators by the figure 8 tie. Ordinarily there are five wires extending from siding to siding and seven wires through sidings. Connection between line and signals is made by No. 14 rubber-covered wires, which are wrapped together with marline, forming a cable which is supported by messenger wire and marline. Brach vacuum lighting arresters are used.

The signals are G. R. S. model 2A. For the high speed signals the mechanism is at the bottom of the post, but for the lower arm of the two-arm signals a top-mast mechanism is used, clamped to the post.

The night color indications are green for clear, red for stop and yellow for caution. The lamps are Dressel, with long-time burners. The signals are operated by Gordon potash batteries, 16 cells, 400 ampere hours capacity. The battery vaults are Potter-Winslow, 60 cells capacity.

At Burnside where this road connects with the New York, Ontario & Western the existing home signals were converted into power signals by clamping top-post mechanisms to the wooden posts. At the same time calling-on arms were fitted to these posts, and a number of outlying switches were fitted with electric locks.

Each of the four maintainer's sections has 47 automatic signals, except that on one, where there are three interlockings, there are only 31 automatics. Each maintainer has a gasoline motor car, and for each car there is a car house 10 ft. x 12 ft.

The work of installation, done by the General Railway Signal Company, was carried out under the supervision of the signal supervisor, who reports to the maintenance of way officers. H. W. Lewis, signal engineer of the Lehigh Valley, was engaged to act as consulting signal engineer and had general supervision of the installation. The signal company did all of the work, with the exception of installing insulated joints and switch rods and rearranging track and switch ties. The material was delivered by work trains, and gasoline motor cars were used by the signal company in transporting men and tools.

Before the signals were put in service, a book of signal rules was prepared and frequent teaching classes were held. All employees whose duties required them to be familiar with the operation of the signals were thoroughly instructed, and no delays or difficulties were experienced in putting the signals into service.

Track and signal maintenance employees all report to the same head, the superintendent of track, bridges and buildings, and he, in turn, reports to the superintendent. This organization provides satisfactorily for co-operation between employees of the track and signal departments. The signal department consists of a supervisor of signals, four maintainers and four batterymen. Signal lights are maintained by trackwalkers, reporting to the section foreman. The signal supervisor also has charge of the installation and maintenance of telegraph and telephone wires and apparatus.

The company has adopted a thorough system of records of performance and reports for four months indicate that the maintenance cost will average $95 per year per signal.

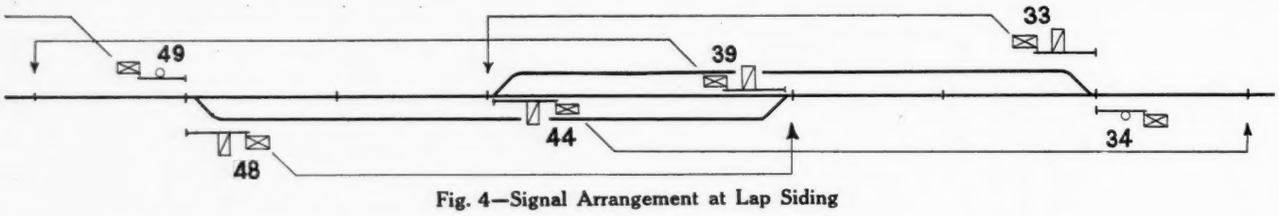


Fig. 4—Signal Arrangement at Lap Siding

GRADE CROSSINGS IN CANADA

The Railway Commissioners of Canada, who have authority to draw on a fund of $200,000 a year for abolition or amelioration of grade-crossing dangers, are asking Parliament for a modification of the law, so as more effectually to carry out its policy of making permanent separation of grades at crossings as fast as is practicable.

This Canadian law is more liberal than those of Massachusetts and New York (which have been the most notable examples of state aid in this country) in that the commissioners have wider discretion, and may make appropriations for the installation of gates or bells, and for the construction of bridges or subways.

The Canadian railway grade crossing fund was set apart by act of Parliament in 1909 to be used as directed by the railway board in aiding the work of protecting or obliterating level crossings. The fund was to amount to $200,000 yearly, and was to be available for a period of five years. The fund can only be utilized in the case of a crossing in existence prior to 1909. Secondly, the contribution to any given work must not exceed twenty per cent of the estimated total cost. Thirdly, the maximum contribution in any instance could not go beyond $5,000. Fourthly, the board could not order a payment from the fund in more than three cases in any municipality within a year.

Assuming that the maximum twenty per cent was contributed by the railway board in every instance, the total cost of the protective work would have to be at least one million dollars a year to absorb the entire amount invested in the fund each year. But the circumstance that not more than three crossings in any municipality can benefit from the fund within the twelve months, coupled with the fact that most of the costly grade separation work, involving the handling of numerous crossings, is done within the limits of a single municipality, has limited expenditures, and the $200,000 has never been fully spent in any year.

The majority of the orders for crossing protection, involving a draft on the grade crossing fund, call for the installation of electric bells, with illuminated danger signs. The second most numerous class are for gates; the third, for the entire separation of grades. For the five years that the fund has been in existence 306 orders have been made, of which 161 have been for bells, 68 for gates, 60 for subways and bridges, 14 for highway diversion and two for highway closing. The railway board, through its staff of inspectors, investigates every crossing accident, and if thought advisable orders protection at such crossing.

The five-year period having expired last spring, the legislation was renewed for a sixth year, but after that it is hoped Parliament will permit a much more generous use of the fund. The twenty per cent limit is satisfactory enough, but the $5,000 maximum is regarded as too small to be of much real value. The installation of bells and gates would not be affected as their cost is comparatively small, but in the building of subways and the erection of bridges, the $5,000 usually represents much less than twenty per cent of the outlay. To increase this limit and encourage the permanent separation of grades is the aim of the proposed legislation.

Methods of Handling L. C. L. Outbound Freight*

A Discussion of the Relative Merits of Two-Wheel, Four-Wheel and Motor Trucks With Cost Statistics

By E. H. Lee
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The handling of L. C. L. freight through freight and transfer houses, excluding inbound houses, involves a sequence of operations which may be divided into:

	Average distribution of house costs at six outbound houses
1. Unloading or checking	32.5 per cent
2. Trucking	43.7 per cent
3. Stowing	13.1 per cent
4. Supervision and miscellaneous	10.7 per cent
	100.0 per cent

In searching for means for increasing economy, the reduction of trucking cost is the item in which the great saving is to be expected, and in order to secure maximum economy the cooperation of the management with the agent and foreman is required. The reduction of trucking cost may seem an insignificant matter to one not closely in touch with freight house work. Allowing for the double handling required under present practice, about 24,000 tons of L. C L. freight is handled per day through freight and transfer houses in Chicago alone, and taking the country as a whole, the L. C. L. tonnage going through freight houses and transfer stations probably approximates 400,000 tons per day. Therefore, it is apparent that if the conclusions reached herein are sound, the possible saving amounts to a large sum,

Almost without exception the handling of material of any kind is based on a few broad principles, although in a given case their application is sometimes difficult to recognize. Ton-mile cost is frequently a useful standard for measuring efficiency in handling materials transported by other means than railroad cars. The means and methods involved in the economical handling of cars that in turn influence ton-mile cost, nearly all have a counterpart in the proper handling of trucks through a freight house. In either case it is essential to the best results that a smooth track or running surface be provided; that adverse grades be reduced or eliminated; that fouling points and causes of interference be avoided; that rehandling be reduced to the lowest terms; that full loading be provided for each carrying unit, and that these be transported over the shortest and most direct line or path at the highest safe speed, so far as is practicable in each item. In either case suitable appliances and equipment are required. Finally, if by good management and proper classification in the one case a larger loading on each carrying unit or car can be assembled with other units into larger trains to be hauled the greatest practicable distance before breaking up, with a favorable effect upon cost, it is fair to presume that the same general practice may have a like favorable effect in the other.

That the four-wheel truck should be generally substituted for the two-wheel truck in all except the smaller houses, and that in outbound freight and transfer houses having sufficient size and business, the use of motor trucks and trailers will save money, are thought to be the general conclusions reached by almost everyone who will analyze the facts. Man power is one of the most expensive forms of power. One authority maintains that its cost per unit of power developed is from 10 to 12 times that of the next less expensive form. Evidently, therefore, where conditions warrant, the substitution of mechanical power offers an effective means of reducing cost.

THE TWO-WHEEL TRUCK

The two-wheel truck has been standard for freight house use for years, and it is still almost universally used. It is suited for economical hauling over short distances, and is convenient and well adapted for use in cramped and narrow runways; but a careful examination shows many defects in its use. Its average load varies from about 200 lb. to approximately 400 lb., a rack being required in the latter case. Roughly, therefore, from five to ten trips are required in transporting a ton of freight through the house. The length of the trucking distance under load probably averages 200 ft. and upward in city freight houses, and thus the two-wheel truck travels from 1,000 to 3,000 ft. per ton. If the gang system of trucking is used, under which from 40 per cent to 50 per cent of the movement is with empty trucks, the distance traveled per ton handled is nearly doubled.

The very general use of the two-wheel truck is responsible for the relatively high trucking cost per ton for handling freight in freight houses. This average cost in over 50 observed cases approximates 10.3 cents per ton per 100 ft., or $5.33 per ton-mile. This cost was determined as follows: In the course of an investigation the writer secured the costs of operation in a large number of houses, and plotted them against the length of house. It was found that the average cost of operation increased about 1 cent for every increase of 35 ft. in the length of the house, the cost of trucking being practically the only cost to increase. Observations of truckers were made in different houses of different lengths, by men working for three different railroads, and with different purposes in view, and it was found that the average round trip trucking distance increased 55.6 ft. per 100 ft. increase in the length of the house. The actual distance the freight moves, of course, is only one-half of this, or 27.8 ft. per 100 ft. of house. The theoretical distance would be 33.3 ft. for every 100 ft. length of house, assuming that all doors receive equal amounts of freight, and that the freight received at every door is evenly distributed among the cars. As the end doors are usually closed, and as teamsters with large shipments for a certain car are often sent to the door nearest that car, the actual is less than the theoretical trucking distance.

If the average cost of operation of a large number of freight houses, in which two-wheel trucks are used, increases 1 cent for every 35 ft. of house, or 2.86 cents per 100 ft., and the average trucking distance that the freight is actually moved is 27.8 ft. for every 100 ft. of house, then the cost of trucking is 10.3 cents per ton per 100 ft. ($\$2.86 \times \frac{100}{27.8} = \$0.103$), or $5.33 per ton-mile. Accurate observations will show that each of the factors in any specific case will vary from the average to some extent, and of course this cost per ton-mile is not applicable in the case of an outbound house, where freight is received only at the door nearest the proper car. But that the cost per ton-mile is correct, as derived above, may be shown by the assumptions, which are thought to be reasonable, and computation which follow:

Assumed:

Average speed of travel for truckers, 1½ mi. per hour.
Average loading of two-wheel truck, 250 lb., or ⅛ ton.
The trucker travels only half the time, the other half being lost at terminals, or the ends of trip. Only ½ the travel time of trucker, or ¼ of his total time, is employed moving with load.
Trucker's rate of pay, 22c. per hour.

Then:

$$\text{Ton miles per trucker} = \text{ave. speed} \times \text{ave. load} \times \frac{\text{Time moving load}}{\text{Total time}}$$

*Abstracted from Bulletin 171 of the American Railway Engineering Association.

Substituting assumed values for one hour:

$$\text{Ton-miles per trucker per hour} = \frac{3}{2} \times \frac{1}{8} \times \frac{1}{4} = \frac{3}{64}.$$

$$\text{Cost per ton-mile} = \frac{\text{Wages per hour}}{\text{Ton-miles per hour}}$$

Substituting assumed values:

$$\text{Cost per ton-mile} = \$0.22 \div \frac{3}{64} = \$4.69$$

It therefore seems conservative to say that ton-mile cost for two-wheel trucking will fall somewhere between $4 and $6 in any given case.

The effect of this ton-mile cost on the cost of freight house operation is apparent. Indeed it becomes startling when compared with ¾ cent per ton-mile, the average freight revenue of the railroads of the country.

THE FOUR-WHEEL TRUCK

The four-wheel truck has now been so far perfected that one man can handle from three to six times the tonnage per trip as compared with the average load on a two-wheel truck, and with no greater fatigue, because the trucker is relieved from carrying any portion of the load on the four-wheel truck, and simply applies the horizontal force required for traction. With the use of the truck carrying the heavier load, a smooth trucking surface is of importance, and commodious truckways greatly facilitate the work. The four-wheel truck has already been adopted in some existing freight houses to the exclusion of the two-wheel truck, except for use in the shortest hauls; and the average loading is at least three times the loading of the two-wheel truck. For special purposes six-wheel trucks and dollies are found convenient.

Some of the objections offered to the use of the four-wheel truck are as follows:

"Their loading involves extra expense."—The observer will note a partial answer to this objection in the fact that two men are often required in loading a two-wheel truck. He will also note that in any trip of a trucker there is a certain amount of lost time at the terminals or ends of each trip. The number of trips made by the four-wheel truck in handling a ton of freight being much less than with the two-wheel truck, the time lost at the terminals per ton handled is also reduced in proportion.

"It is necessary to mix freight on the truck to procure full loading."—This, while true, is not a vital objection. The freight on a "peddler" truck can be classified for the cars in a certain rank or for ranks opposite a certain section of the house, the freight being loaded on the truck in proper sequence so that it may be convenient for unloading. To make such a classification most advantageously, an ample number of trucks is needed.

In loading cars for the way-freight train on the road, many are given a mixed loading. During the time such mixed freight is being handled at the way station, the expense for locomotive and crew is a dead loss, and in most cases the main track is blocked. Moreover, at most way stations the facilities for handling L. C. L. freight are so poor that the actual expense of handling is excessive. For these reasons some relatively light setout cars are run, yet it would not be considered good practice to run cars with only 25 or 30 per cent of their average loading merely to avoid mixing freight in them. With a proper system of classification, mixing freight on the four-wheel truck is free from the objections that apply to the practice with the freight car on the road; therefore all the greater is the disadvantage and loss caused by multiplying the distance required to handle the truck by three or four, merely to avoid a relatively small loss required by the classification described.

"The use of the four-wheel truck increases the cost of stowing."—This may well be doubted. The use of stowers is required by the "drop truck," or "no gang" system, and this system probably saves money, although in this respect some difference of opinion may exist. The use of the four-wheel truck is particularly well adapted to the drop-truck system. Actual practice with the use of the four-wheel truck has shown that mixing freight on the "peddler" truck has actually made a substantial reduction instead of tending to increase the overs and shorts in the freight car. Moreover, it cannot be doubted that any extra expense involved in careful and proper stowing of L. C. L. freight in cars reduces the damage in transit and the placing of freight in the wrong car sufficiently to more than offset the extra stowing expense.

"Four-wheel trucks are not adapted for passing into and through cars."—This objection, so far as it applies to the improved trucks now manufactured, is without foundation.

If the loading on the four-wheel truck is three times that on a two-wheel truck, it might seem that by the use of the former trucking, cost should be reduced 66 per cent, but this is somewhat too much to expect. In the opinion of the writer, some additional labor is to be expected in sorting the freight onto trucks, as several shipments are required to make a truck load, the average shipment being only about 400 lb., to the best of our information. In certain cases additional expense for stowers is involved, but this is a positive advantage for the reasons already given.

The trucker can hardly be expected to travel so rapidly with the larger load, although an improvement in the floor or trucking surface will frequently offset this difference. It may be said here that a smooth trucking surface is a profitable investment in almost any house. Officers who would promptly authorize the repair of rough main tracks, sometimes fail to appreciate that a rough trucking surface, although not involving the same elements of danger as a rough track, probably has a relatively greater effect upon the cost of transportation over it.

MOTOR TRUCKS

In the fall of 1912 an investigation into facilities for handling L. C. L. freight was made by the writer for his company. This covered appliances and methods, as well as the general arrangement of houses and tracks. At that time the Chicago & Eastern Illinois had one motor truck in service in its outbound freight house in Chicago. The results of the operation of this truck strongly attracted the attention of the writer. Accurate observations and a one-day's record of the performance of this truck were made in November, 1912. On that day it hauled 88 tons, with an operator and one assistant. On the same day the men with two-wheel trucks handled from 10 to 15 tons. The motor truck reduced the cost of trucking 9.3 cents per ton for the freight it handled. These results were so satisfactory that shortly afterward two additional motor trucks were purchased and put in service.

The Chicago and Eastern Illinois has further perfected its system of motor trucking in the two years since 1912. To obtain further information, observations and records of the performance of each of these three similar motor trucks were made on September 4, 1914. In the last case three motor trucks each handled an average of 172 tons over an average distance of 393 ft. at a cost of 3.6 cents per ton. Each motor, therefore, carried 12.8 tons one mile at a cost of 48 cents per ton-mile. The average time per loaded trip was 5 min. and 18 sec. An average of 3,070 lb. was carried per loaded trip on 2.71 trailers, or 1,130 lb. per trailer. The three motors handled 515 tons, or 65.1 per cent of the total tonnage. The average weight per shipment on that day was 398 lb., and as the average trailer load was 1,130 lb., it was evidently necessary to mix the loading on a considerable percentage of the trailer trucks. These "peddler" trucks were hauled by the motor to the proper section of the house, and there distributed into cars, as previously described. Two truck switchmen made up trailers into trains for the motor trucks, one working in each half of the house. Trailers were made up into station order, the last in the train being the first dropped. Hand trucking was used for distances of about 100 ft. or less. In this house motor trucks and trailers are considered to be better adapted for handling long pipe, sheet iron, lumber, machinery, pianos and other awkward and bulky freight than two-wheel trucks. One should note that much of the improvement made in the tonnage handled by mo-

tor trucks in the two years was due to the elimination of all loading from the motor truck, its use being confined strictly to the development of power.

On September 10, 1914, similar observations were made of the use of motor trucks in the Chicago, Burlington & Quincy Harrison St. freight house, Chicago, where five motor trucks to handle trailers had been installed in July, 1913. These observations at both the C. & E. I. and C., B. & Q. houses are believed to represent general conditions accurately because they were all made upon days when business and conditions were normal.

The system of operation at the C., B. & Q. house is similar to that at the C. & E. I. house. Six motor trucks were used, a seventh being added in the afternoon only. The motors averaged 88 tons each per day, hauling on an average two trailers per loaded trip, with 1,111 lb. of freight each, or 2,222 lb. per loaded trip of the motor truck. The average distance hauled was 642 ft. The motors, therefore, average 10.7 ton-miles per day. The cost of motor trucking was 4.8 cents per ton, or 39.2 cents per ton-mile. It will be noted that the average haul in the Burlington house is greater than in the C. & E. I. house, due largely to the design of the house. A substantial saving in the cost of operation has been made in this house during the last ten months, due mainly to the use of motor trucks with trailers.

In the investigation made in 1912, the use of motor trucks on several piers in New York City and at various transfer stations in the east was observed. At some of these points the use of these trucks was considered satisfactory, although in none was the same efficiency obtained as in the cases cited in Chicago. The reason is plain. The motor truck was used for carrying freight, instead of hauling it. A large part of the motor's time was therefore lost in loading and unloading, and the average load was relatively smaller. For the same reason automobile trucks for general road and street use have proved economical for the handling of miscellaneous material, only when their running time is largely in excess of their standing time, and therefore their use for handling materials whose loading requires too much time has been limited, and in some cases entirely abandoned.

In designing plans for new house and track layouts, changes from present standards are required if motor trucks are to be used, in order to secure maximum efficiency. In substituting four-wheel trucks for two-wheel trucks, and in determining where motor trucks are warranted, how large the installation shall be, and what changes, if any, shall be made in existing houses and track layouts, a careful investigation is needed.

The comparative merits of the methods mentioned herein of trucking as compared with hand trucking with two-wheel trucks, may be shown by the following mathematical statement, bearing in mind that the comparison is only applicable to the truck while actually traveling:

Letter a = Average loading per truck.
b = Number of trucks handled as unit or train.
c = Relative speed of travel.
d = Relative average length of truck haul, or distance.
e = Relative average cost per unit of time.

For the purpose of comparison all these various factors may be assumed as unity in the case of the two-wheel truck. For the four-wheel truck handled by hand the value of (a) is increased to 3 or more, and (c) should probably be some fraction of unity, say, 70 to 80 per cent, which may. however, be increased in some cases by improving local conditions.

For motor trucks and trailers, the various factors may be assumed as follows:

a = 3 to 4
b = 3 to 6
c = 2 to 4
d = *X*, except that for a given house where two-wheel trucks are in use it equals 1.
e = 2 to 3

1. For hand trucking with two-wheel trucks the expression becomes:

$$\frac{a \times b \times c}{d \times e} = \frac{1 \times 1 \times 1}{1 \times 1} = 1$$

2. For hand trucking with four-wheel trucks it becomes:

$$\frac{a \times b \times c}{d \times e} = \frac{3 \times 1 \times 0.7}{1 \times 1} = 2.1$$

3. For motor trucking with four-wheel trailers it becomes:

$$\text{Minimum } \frac{a \times b \times c}{d \times e} = \frac{3 \times 3 \times 2}{1 \times 2} = 9$$

$$\text{Maximum } \frac{a \times b \times c}{d \times e} = \frac{4 \times 6 \times 4}{1 \times 3} = 32$$

That is to say, if the values assumed in case 3 meet the conditions correctly in the assumed minimum, the same tonnage will be handled by motor truck for 1/9 the cost, or nine times the tonnage will be handled for the same cost. In the assumed maximum the corresponding values are 1/32 or 32, as compared with hand trucking by two-wheel trucks.

The actual efficiency of the motor truck with trailers is somewhat less than this theoretical efficiency, because among other reasons, loads must be mixed, in order to obtain the best results, as already described, and then be "peddled out" to several cars in one section of the house. The results found at the two houses investigated do not show as great an increase in efficiency per ton handled through the house as the formula would indicate, the actual cost per ton of hand and motor trucking being in the ratio of 4 to 1 in one case, and 6 to 1 in the other. The cost per ton-mile, however, is in the ratio of 12 to 1 and 14 to 1, respectively. In these houses the short hauls are made by hand and the long hauls by motor. There are two additional reasons for the efficiency being below the theoretical. First, neither house was designed for motor truck operation, having been built several years ago, and there is not sufficient space available for their use to best advantage. Moreover, the traffic has outgrown the facilities in each case. Second, as both two-wheel and four-wheel trucks are used in hand operation, an actual comparison between motor trucks and two-wheel or four-wheel trucks is difficult. It is believed that under more favorable conditions, motor trucks would show still lower costs.

GENERAL CONCLUSIONS

1. Motor trucks, when used without trailers, tend to decrease the cost of trucking freight, because they form single units of higher capacity and greater speed than do men with two-wheel trucks; but as their cost of operation per day is greater than the cost of a man and a two-wheel truck, the saving is not large, and unless conditions are favorable (long haul, heavy packages, etc.), no saving is made. When compared with a man and a four-wheel (platform) truck, there is no saving, for the two have about the same carrying capacity, and the higher speed of the motor is more than offset by its greater cost of operation.

2. Motor trucks, when used as power for hauling loaded four-wheel trucks as trailers, show favorable results and greatly decrease the costs per ton. They can pull six times the load at twice the speed of a man with a four-wheel truck, at about twice the expense. Motor trucks should, therefore, be used to haul and not to carry freight. Under such a system they form an efficient, reliable and economical means of trucking freight.

3. To insure full train loads, an ample supply of four-wheel or six-wheel trucks and dollies is necessary.

4. Motor trucks, when used as tractors, can handle practically all kinds of L. C. L. freight.

5. Motor trucks need wide station platforms, and open runways wide enough to permit two motor-truck trains to pass each other, in order to secure the best results.

6. "Fouling points" or "interferences" should be reduced or eliminated entirely.

7. In motor truck operation, distance is a relatively unimportant factor, for once a train is made up and in motion, the cost per ton per 100 ft. is low.

8. Under fair conditions, on an ordinary freight platform, where the motor must operate largely as a way-freight, it can

handle from 150 to 200 tons per day per motor, and do from 10 to 15 ton-miles of trucking.

9. Under ideal conditions, where the motor can operate as a "through freight," i. e., pull a solid train of five or more trailers from origin to destination without stop and with few or no delays, a motor can probably be expected to handle from 250 to 500 tons per day, or do from 30 to 60 ton-miles of trucking.

10. Finally, while the substitution of the four-wheel truck for the two-wheel truck saves money, if conditions warrant, its use is particularly valuable because it may be a preliminary step to the use of one or more motor trucks, if the volume of tonnage and local conditions indicate the need of a tractor. This method of procedure also eliminates the danger of installing motor trucks at a heavy investment expense, to perform work which the four-wheel truck used as a trailer will do more economically.

OPERATION OF MOTOR TRUCKS AT THE C. & E. I. OUTBOUND FREIGHT HOUSE, CHICAGO, SEPTEMBER 4, 1914

Total tons handled	791
Tons handled by motors	515, or 65.1 per cent of total
Cost of 3 motor trucks for one day	$18.57
(Wages of motormen, electricians, truck switchmen, current, interest, depreciation and repairs included.)	
Cost per ton of trucking by motor	3.6 cents

Distribution of Motor Truck Time per Average Loaded Trip

	Time	Per Cent
Moving, loaded	2 hr. 20 min.	44.4 per cent
Moving, empty	1 hr. 00 min.	18.7 per cent
Delayed	0 hr. 41 min.	12.6 per cent
Loading and unloading	1 hr. 17 min.	24.3 per cent
Total time	5 hr. 18 min.	100.0 per cent

Average per Motor

Tons carried	172
Miles, loaded	11.0
Miles, empty	4.2
Tons carried one mile	12.8
Average haul	393 ft.
Average weight per trailer	1,130 lb.
Average trailers per loaded trip	2.71
Average weight per loaded trip	3,050 lb.
Average loaded trips	113
Average loaded trip per hour	11.3

NOTE.—As but one motor is permitted on the transfer platform in this house, because of its width (11 ft.), part of the freight is handled twice by motor, once in the house and once on the platform. This reduces the figure of 515 total tons handled by motor to about 450 tons (net) handled by motor. This also reduces the average haul by 33 per cent, and consequently a larger number of trips were made.

OPERATION OF MOTOR TRUCKS AT THE C. B. & Q. OUTBOUND FREIGHT HOUSE, CHICAGO, SEPTEMBER 10, 1914

Total tons handled	1,045
Tons handled by motor trucks	571, or 54.7 per cent of total
Cost of motor trucks per day (current, interest, motormen, depreciation and care included)	$27.17
Cost per ton for motor trucking	4.76 cents
Cost per ton-mile for motor trucking	39.2 cents*

Distribution of Motor Truck Time per Average Loaded Trip

	Time	Per Cent
Moving, loaded	3 hr. 20 min.	44.5 per cent
Moving, empty	1 hr. 24 min.	18.6 per cent
Delayed	0 hr. 53 min.	11.8 per cent
Loaded or unloaded	1 hr. 53 min.	25.1 per cent
Total	7 hr. 30 min.	100.0 per cent

Average per Motor

Tons carried	88
Miles, loaded	17.5
Miles, empty	5.0
Tons carried one mile	10.7
Average haul	642 ft.
Average weight per trailer	1,111 lb.
Average trailers per loaded trip	2.0
Average weight per loaded trip	2,270 lb.
Average trips, loaded	77.4
Average loaded trips per hour	7.7

*NOTE.—In comparing this cost of motor trucking, 39.2 cents per ton-mile, with the average hand trucking cost of some 58 freight houses using two-wheel trucks, of $5.33 per ton-mile, the motor trucks show an efficiency 14 times greater than that of two-wheel hand trucking, or in other words the cost of motor trucking per ton-mile is only one-fourteenth that of hand trucking.

RAILWAY AFFAIRS IN OTHER COUNTRIES

A recent despatch from Sir John French, commanding the British forces in France, reveals a railway feat by the French railways and the Chemin de Fer du Nord, in particular, which deserves notice. It was nothing less than the transport of the entire British force from the region of the river Aisne to its present field of operations in northeast France and western Belgium. The withdrawal commenced on October 3, the entraining station being apparently Compiègne, a town situated near the junction of the Aisne with the Oise. The detraining station for all, or the bulk of the forces, was St. Omer, a town 97 miles almost due north of Compiègne. But the troops had to be brought through Amiens, Abbeville, along the coast to Boulogne and Calais and thence southeast to St. Omer, a total railway journey of about 180 miles. The operation was completed in 16 days. The cavalry went first, and was actually in contact with the enemy some distance south of St. Omer on October 11. On the evening of the same day the Second Army Corps had completed the journey and had taken up its position beside the cavalry. Simultaneously, the Third Army Corps was completing its detrainment at St. Omer. The First Army Corps arrived and was detrained at St. Omer by the 19th. According to one military correspondent this movement required all told something like 609 trains, comprising about 16,800 cars, an average of 32 trains a day, or one every three-quarters of an hour throughout the day and night. Men, horses, guns, kit and transport were all included, and the whole operation had to be conducted almost under the nose of the enemy.

* * *

One of our friends who has recently gone to England and obtained work in a running shed (engine house) there writes an interesting letter concerning conditions in that country as follows: "As everyone knows, a great many railwaymen have enlisted, but now no one is allowed to enlist without permission of his superior officer, which at present and according to government instructions, is not being given. But before long more will have to go and the services will consequently have to be curtailed. Conditions, however, are surprisingly normal. Practically the usual winter schedules are in force. Occasionally the services may be reduced or suspended for a day on account of troop movements. Various precautionary measures are in evidence. Stations, bridges, tunnels and the right of way are, of course, carefully patrolled. In the London district the shades of all windows on coaches are required to be pulled down at night because it is supposed that should a Zeppelin be about, one of its chief objects would be to destroy railway lines and hence interfere with mobilization and supplies. At a very little distance the trains with shades pulled down are scarcely distinguishable, and I suppose at an elevation of half a mile they would be invisible. At stations and yards, of course, the illumination is greatly reduced. The London Tube railways state and truly, too, on their advertising posters that 'It's bomb-proof down below.'"

* * *

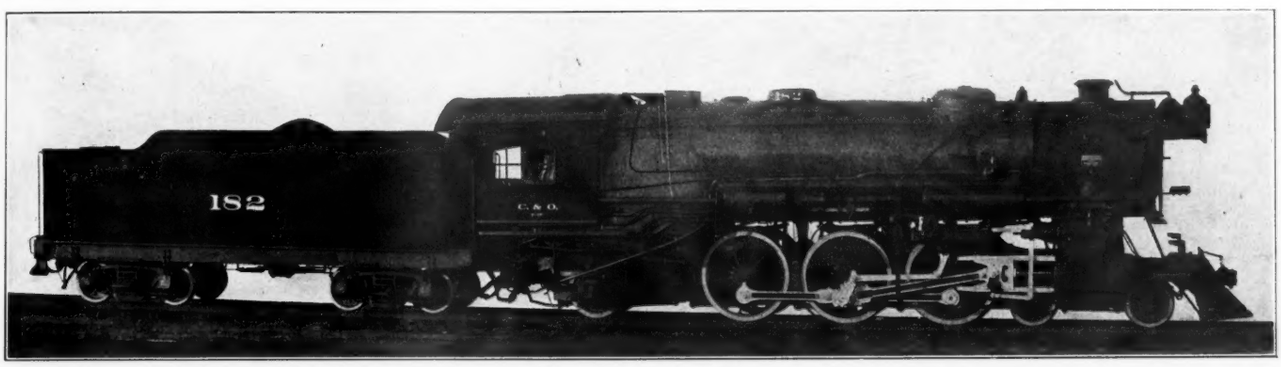
The question of strategic railways has recently assumed a great practical importance in both Australia and South Africa. The Australian War Railway Council, which is composed of the state railway commissioners and representatives of the Defense Force, is reported to have in contemplation a strategic railway between Adelaide and Brisbane. As these cities are already linked up by the trunk line running via Melbourne and Sydney, it is quite possible that the government may not be inclined to consider the expenditure just now, even though the advantages of the project combine the reduction of the distance between Adelaide and Brisbane by one-half with the strategic possibilities of the scheme. In South Africa an important section of strategic railway has just been constructed. This is the Prieska-Upington Railway, over which the first train was run on November 18. The line has been laid with remarkable rapidity. Construction was begun in the early part of September, and as the line is 142 miles in length, the rate of track laying averaged over two miles a day. The earthworks were light, however, the line following the Orange river almost its entire length; and only three small watercourses had to be bridged. Construction was determined upon in order to facilitate the conduct of military operations in German South-West Africa, and it is expected that the line will be extended to Kalkfontein, the German railhead, for strategic reasons. The present terminus, Upington, is about 80 miles as the crow flies from the southeastern extremity of German Southwest Africa, and about twice that distance from the German railhead.

Two Pacific Type Locomotives of High Power

Chesapeake & Ohio Engine Develops Tractive Effort of 46,600 lb.; First of This Type for Delaware & Hudson

The American Locomotive Company has recently delivered to the Chesapeake & Ohio six Pacific type locomotives and ten of the same type to the Delaware & Hudson Company.

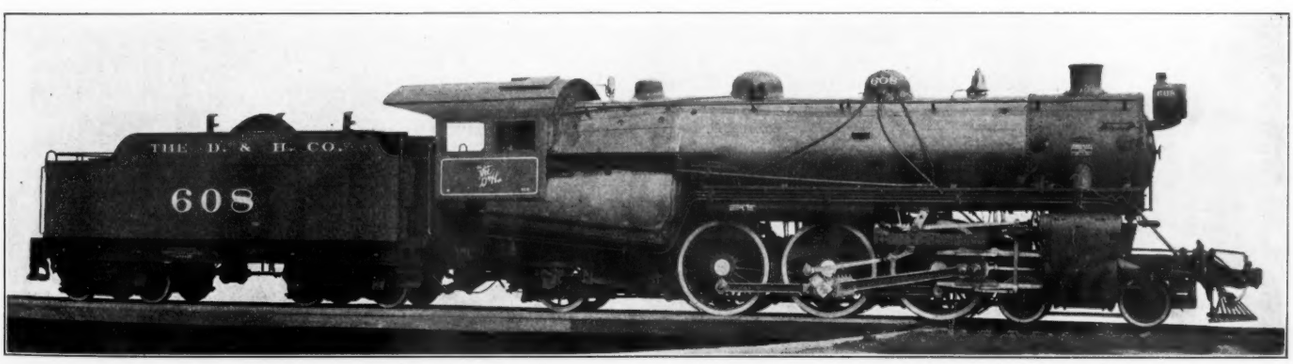
The Chesapeake & Ohio engines have a maximum tractive effort of 46,600 lb., the highest tractive effort for locomotives of this type of which we have record. They have been put in service between Charlottesville, Va., and Hinton, W. Va., a distance of 175 miles. This part of the line crosses three mountain summits: the Blue Ridge, North Mountain and the Alleghanies. To economically handle the through passenger service is a difficult problem. The mountain resorts, among which are the Virginia Hot Springs and the White Sulphur Springs of West Virginia, demand the best of service and equipment. Trains of ten all-steel cars, weighing 674 tons, are a regular daily problem, and this has heretofore required frequent double heading.



Chesapeake & Ohio Pacific Type Locomotive Which Has a Maximum Tractive Effort of 46,600 lb.

The requirements that must be met in order to make the schedule time on the Clifton Forge division are extremely difficult. Westbound from Mechums River to the summit of the Blue Ridge is a continuous uncompensated grade of 75 ft. to the mile, with curves of 10 deg., and extending a distance of 14 miles. One train of ten steel cars, weighing 674 tons, is scheduled at 22½ miles an hour on this grade, while another train of eight steel cars, weighing 551 tons, is scheduled at 29 miles an hour. From Staunton to the summit of North Mountain, a distance of 13 miles, the conditions are still more difficult. The first 6½ miles contain 4½ miles of up-grade, varying from 75 to 80 ft. to the mile, and the last 6½ miles is a continuous grade of 80 ft. to the mile. The scheduled speed for the first mentioned train is 25½ miles an hour, and for the second, 35 miles an hour for this 13 miles. The schedule over the remaining part of the division permits but little time to be made up. These new engines, while as yet in service but a short time, are satisfactorily handling these trains.

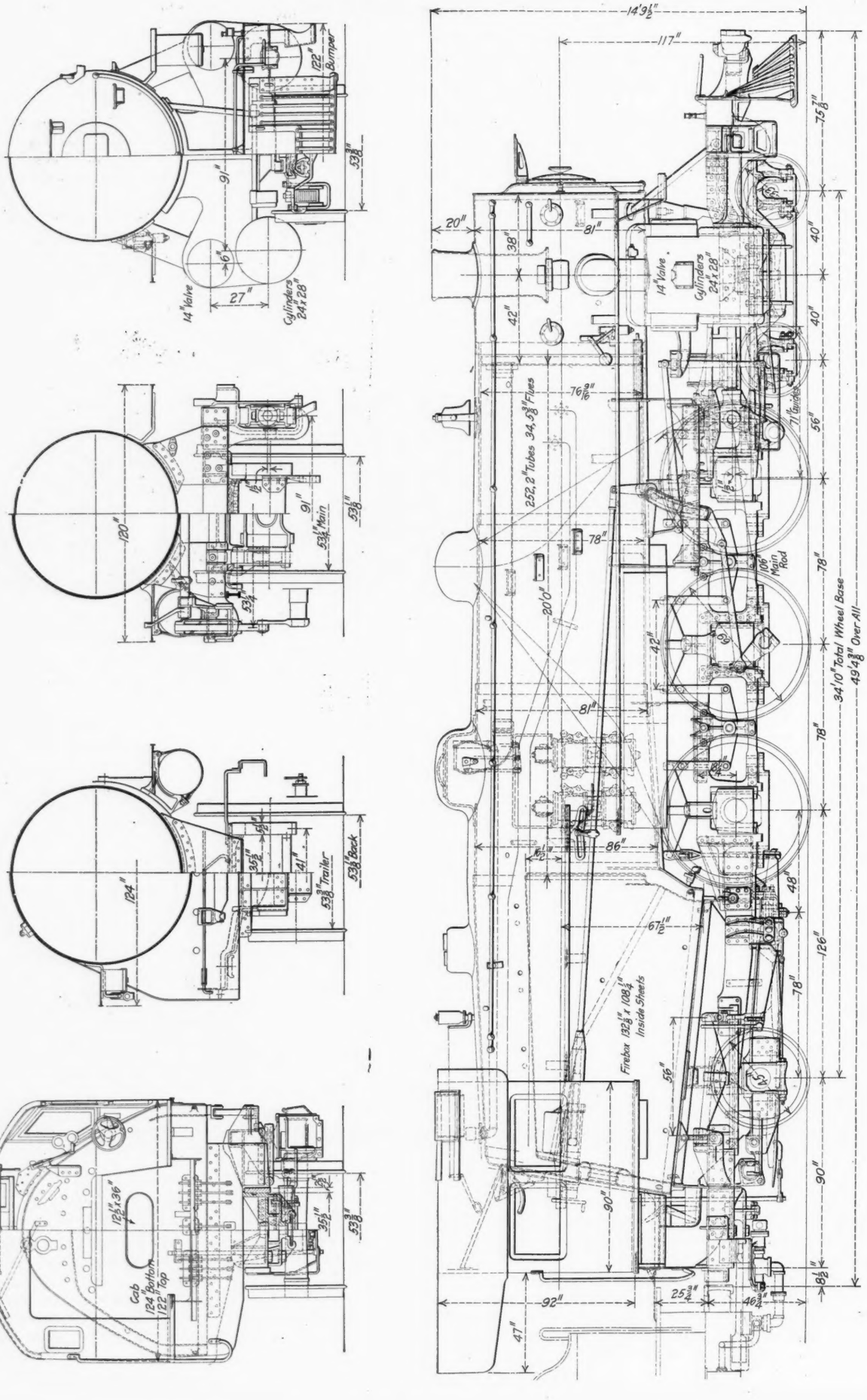
No innovations were attempted in the construction of these locomotives, but the different factors were combined to give as powerful a machine as possible within the clearances. The boiler is of exceptional capacity. It is of the extended wagon top type, and at the first course the barrel is 83 11/16 in. in diameter outside, while the outer diameter of the largest course is 90 in. The barrel is fitted with 244 tubes, 2¼ in. in diameter, and 43 flues, 5¼ in. in diameter and 20 ft. 6 in. long. The firebox is 120⅛ in. long and 96¼ in. wide, having a total depth of 82¼ in. The depth from the center of the lowest tube to the top of the grate is 25⅛ in. To insure a constant supply of fuel to this firebox burning bituminous coal and having a grate area of 80.4 sq. ft., a mechanical stoker had to be applied. This is a type C, Street machine, manufactured by the Locomotive Stoker Company, New York.



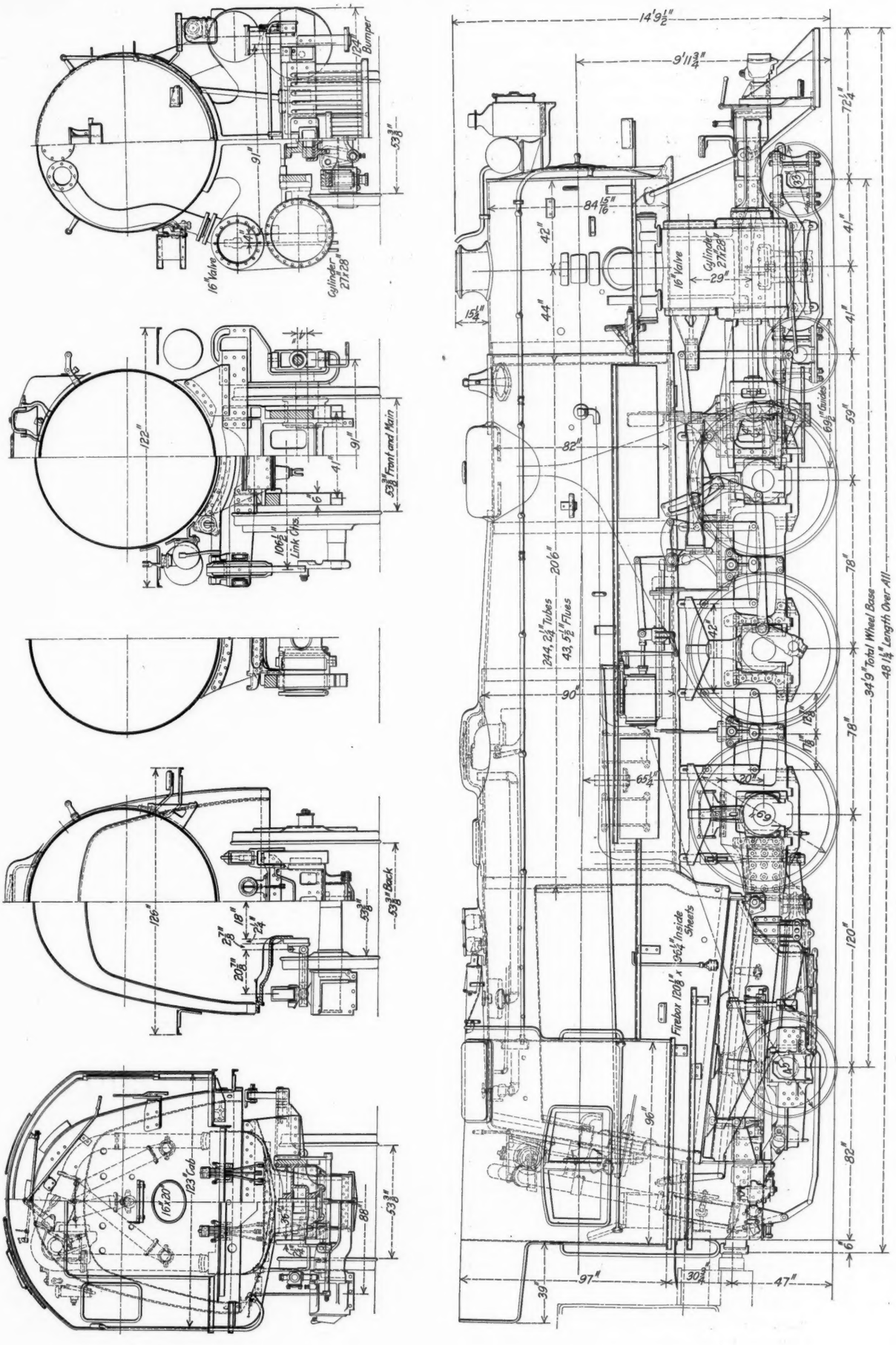
Anthracite Coal Burning Pacific Type Locomotive for the Delaware & Hudson Company

The large boiler and wide firebox and the application of the stoker made the arrangement of the cab a difficult matter, but this was improved considerably by the use of non-lifting inspirators, Ragonnet reverse gear and the placing of the steam turret outside of and in front of the cab. Clearance restrictions made it necessary to place the bell off the center of the boiler and the headlight dynamo in front of the smokebox.

The frames are 6 in. wide and braced by box castings. The piston rod extension is the American self-centering type. Wal-



General Arrangement of the Delaware & Hudson Pacific Type Locomotive



Elevation and Cross Sections of the Chesapeake & Ohio Pacific Type Locomotive

schaert valve gear is used with the valve stem guide integral with the steam chest cover; the piston valves are 16 in. in diameter.

The special equipment includes the Schmidt superheater, Cole outside journal trailing truck, radial buffing device, Security brick arch, Franklin pneumatic grate shaker, Cole long main driving box, Trojan packing, vanadium steel frames and rods, Mellin by-pass valve, Hancock 5,500 gallon capacity non-lifting inspirators, Watters sanders, Nathan lubricators, Westinghouse-American driver brakes and Westinghouse-Farlow draft gear.

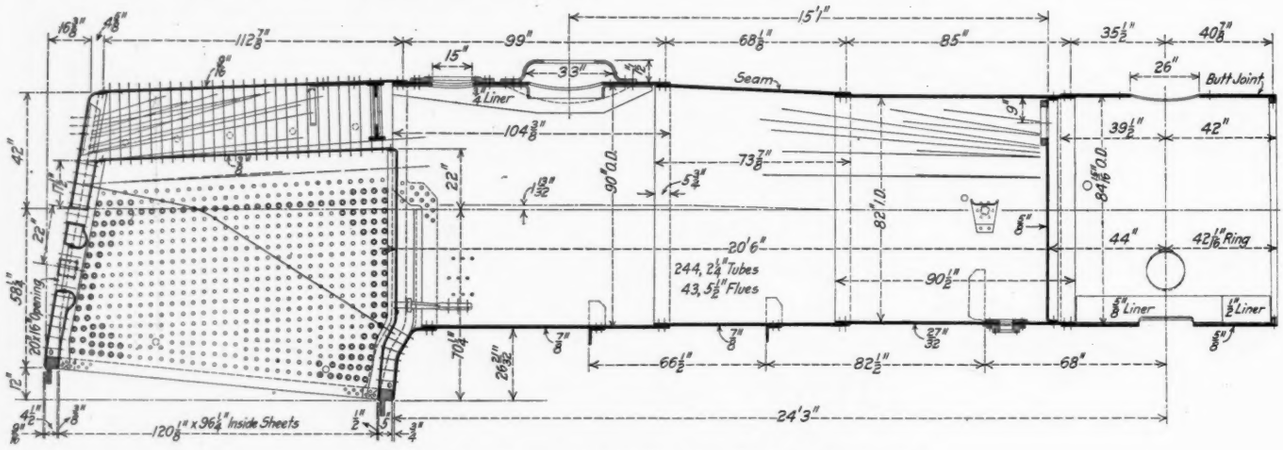
THE DELAWARE & HUDSON LOCOMOTIVES

The ten anthracite-burning Pacific type locomotives for the Delaware & Hudson Company are the first of this type to be used on that road, the heavy passenger service having up till now been handled by Ten-wheelers.

The Ten-wheel locomotives have a total weight, including the tender, of 313,900 lb., the tenders having a capacity of 7,000 gal. of water and 12 tons of coal. With driving wheels 69 in. in diameter, 200 lb. steam pressure and cylinders 21 in. by 26 in., they develop a tractive effort of 28,300 lb. The new Pacific type engines have a total weight, engine and tender, of 460,100 lb., the tender having a capacity of 8,000 gal. of water and 14 tons of coal. They have driving wheels 69 in. in diameter, 205 lb. steam pressure and cylinders 24 in. by 28 in., and develop a tractive effort of 40,730 lb. This is an increase of 46.6 per cent in total weight and 44 per cent in tractive effort. The engines are equipped with the Schmidt superheater, brick arch, screw reverse gear, extended piston rods, long main driving box, Economy engine and tender trucks, Economy pipe clamps, Economy radial buffer, and speed recorders. Vanadium steel was used in the main frames, driving elliptic springs, engine truck elliptic springs and the tender truck elliptic springs.

The following table gives the principal dimensions and ratios of both the Chesapeake & Ohio and the Delaware & Hudson locomotives:

	C. & O.	D. & H.
General Data		
Gage	4 ft. 8½ in.	4 ft. 8½ in.
Service	Passenger	Passenger
Fuel	Soft coal	Hard coal
Tractive effort	46,600 lb.	40,730 lb.
Weight in working order	312,605 lb.	293,500 lb.
Weight on drivers	191,455 lb.	191,000 lb.
Weight on leading truck	56,675 lb.	47,500 lb.
Weight on trailing truck	64,475 lb.	55,000 lb.
Weight of engine and tender in working order	497,100 lb.	460,100 lb.
Wheel base, driving	13 ft. 0 in.	13 ft. 0 in.
Wheel base, total	34 ft. 9 in.	34 ft. 10 in.
Wheel base, engine and tender	71 ft. 11¼ in.	70 ft. 4¼ in.
Ratios		
Weight on drivers ÷ tractive effort	4.12	4.79
Total weight ÷ tractive effort	6.72	7.20
Tractive effort × diam. drivers ÷ equivalent heating surface*	538.00	553.00
Evaporative heating surface ÷ grate area	55.80	39.20
Equivalent heating surface* ÷ grate area	74.30	51.30
Firebox, heating surface ÷ equivalent heating surface,* per cent	4.74	5.45
Weight on drivers ÷ equivalent heating surface*	32.25	37.60
Total weight ÷ equivalent heating surface*	52.30	57.70
Volume both cylinders, cu. ft.	18.55	14.66
Equivalent heating surface* ÷ vol. cylinders	322.00	348.00
Grate area ÷ vol. cylinders	4.33	6.77
Cylinders		
Kind	Simple	Simple
Diameter and stroke	27 in. by 28 in.	24 in. by 28 in.
Valves		
Kind	Piston	Piston
Diameter	16 in.	14 in.
Greatest travel	6 in.	6½ in.
Outside lap	1 in.	1⅛ in.
Inside clearance	⅛ in.	3/16 in.
Lead in full gear	3/16 in.	Line and line
Wheels		
Driving, diameter over tires	69 in.	69 in.
Driving, thickness of tires	3½ in.	3½ in.
Driving journals, main, diameter and length	11½ in. by 23 in.	11 in. by 22 in.
Driving journals, others, diameter and length	10½ in. by 14 in.	11 in. by 13 in.
Engine truck wheels, diameter	33 in.	33 in.
Engine truck, journals, diameter and length	7 in. by 12 in.	6½ in. by 12 in.
Trailing truck wheels, diameter	45 in.	45 in.
Trailing truck journals, diameter and length	9½ in. x 16 in.	9½ in. by 16 in.
Boiler		
Style	Wagon top	Straight top
Working pressure	185 lb.	205 lb.



Boiler for the Chesapeake & Ohio Pacific Type Locomotive

weigh 293,500 lb. in working order, of which 191,000 lb. is on the drivers.

The advantage of the Pacific type over the Ten-wheel locomotives in sustained capacity is demonstrated by a comparison of the boilers.

	Pacific	Ten-wheel
Grate area	99.3 sq. ft.	84.9 sq. ft.
Heating surface, tubes	2,627.0 sq. ft.	2,406 sq. ft.
Heating surface, flues	952 sq. ft.	.....
Heating surface, fire brick tubes	40 sq. ft.	78 sq. ft.
Heating surface, firebox	277 sq. ft.	178 sq. ft.
Heating surface, total	3,896 sq. ft.	2,662 sq. ft.
Superheating surface	796 sq. ft.	.....

Comparing the equivalent heating surface, which includes 1½ times the superheating surface, we have 5,090 sq. ft. for the Pacific as against 2,662 sq. ft. for the Ten-wheeler, or an increase of 91.3 per cent.

According to the method of boiler proportioning used by the American Locomotive Company, these Pacific type engines have 111 per cent boilers. In a general way, a boiler will have ample steam making capacity if proportioned by this method for 100 per cent, but for passenger service, it is advantageous to make the boiler over 100 per cent when possible.

The design of these locomotives was developed by the mechanical department of the Delaware & Hudson Company in cooperation with the American Locomotive Company. The engines

Outside diameter of first ring...	83 11/16 in.	78 in.
Firebox, length and width.....	120⅛ in. by 96¼ in.	132⅛ in. by 108¼ in.
Firebox plates, thickness.....	⅜ in. and ½ in.	⅜ in. and ½ in.
Firebox, water space.....	4½ in. sides and back; 5 in. front	4½ in. sides and back; 5 in. front
Tubes, number and outside diameter	244—2¼ in.	252—2 in.
Tubes, material and thickness...	Seamless steel, 0.125 in.	Seamless steel, No. 11, B. W. G.
Flues, number and diameter....	43—5½ in.	34—5⅜ in.
Flues, material and thickness...	Seamless steel, 0.15 in.	Seamless steel, No. 9 B. W. G.
Tubes and flues, length.....	20 ft. 6 in.	20 ft. 0 in.
Heating surface, tubes and flues.	4,196 sq. ft.	3,579 sq. ft.
Heating surface, firebox.....	255.4 sq. ft.	277 sq. ft.
Heating surface, arch tubes.....	27.4 sq. ft.	40 sq. ft.
Heating surface, total.....	4,478.8 sq. ft.	3,896 sq. ft.
Equivalent heating surface*.....	5,965.3 sq. ft.	5,090 sq. ft.
Superheater heating surface....	991.0 sq. ft.	796 sq. ft.
Grate area	80.33 sq. ft.	99.3 sq. ft.
Smokestack, diameter	20 in.	19 in.
Smokestack, height above rail...	14 ft. 9½ in.	14 ft. 9½ in.
Center of boiler above rail.....	9 ft. 11¾ in.	9 ft. 9 in.
Tender		
Tank	Water bottom	Water bottom
Frame	13 in. steel channels	15 in. steel channels
Wheels, diameter	36 in. forged steel	33 in. rolled steel
Journals, diameter and length..	6 in. by 11 in.	6 in. by 11 in.
Water capacity	9,500 gal.	8,000 gal.
Coal capacity	14 tons	14 tons

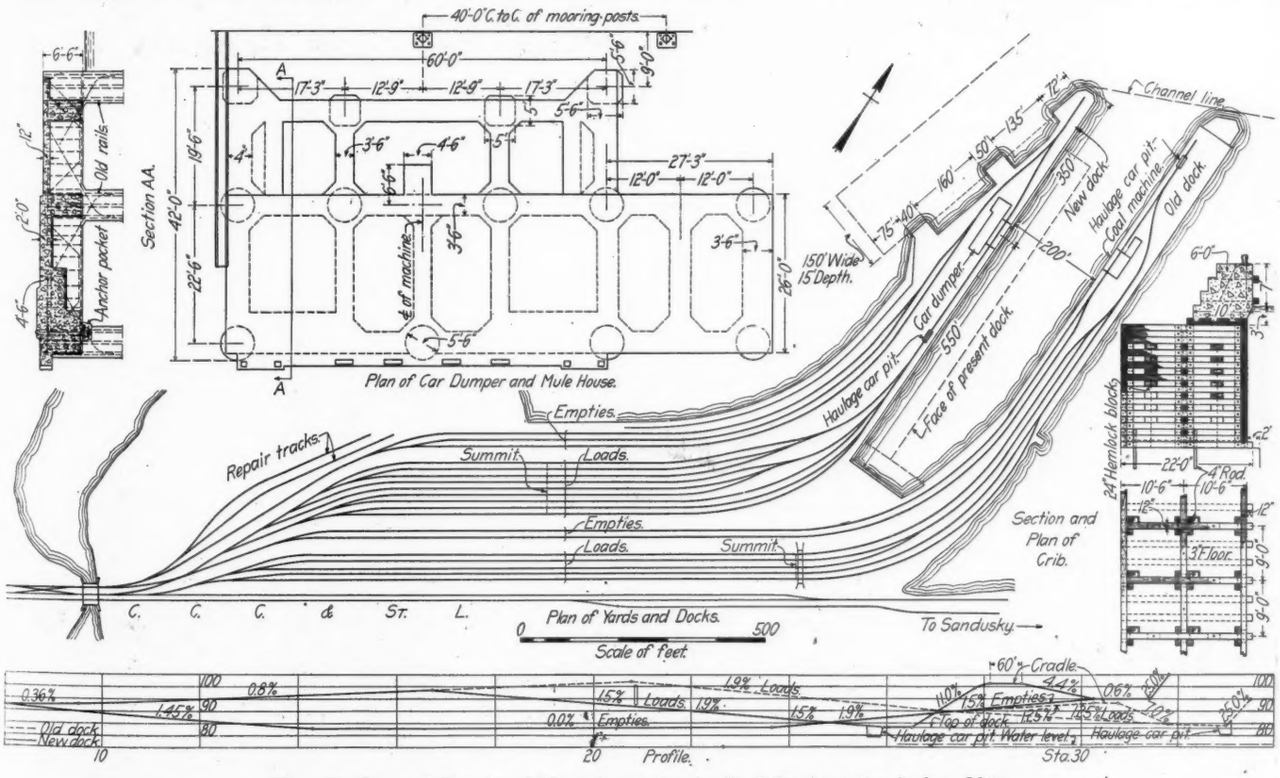
*Equivalent heating surface = total evaporative heating surface + 1.5 times the superheating surface.

PENNSYLVANIA COAL DOCK AT SANDUSKY

The capacity of the single car dumper which has been in service on the Pennsylvania coal dock at Sandusky (Ohio) has been insufficient to handle the amount of coal which it was desired to load on lake boats at that point. This dock is operated by the Lower Lakes Company, which buys coal principally in the West Virginia fields, shipping it over the Norfolk & Western to Columbus, and thence over the Pennsylvania to Sandusky. In order to provide the desired increase in capacity at this point, a second dock with a car dumper having a number of improved features has been built. Preliminary work was started in the fall of 1913 and, beginning last spring it was pushed as rapidly as possible, with the result that the plant was ready to load the first boat on July 15. The dumper is designed to handle 100-ton cars at a rate of 40 per hour in continuous operation. The work has involved the placing of 5,000 cu. yd. of concrete, the dredging of 15,000 cu. yd. of rock, and 125,000 cu. yd. of mud, the placing of 2,000,000 ft. B. M. of hemlock lumber in the crib work under the new dock and 190,000 cu. yd. of filling material in the new dock, and the embankment for the new yard serving the dock.

The old plant consisted of the coal pier, small yards for loaded and empty cars, and an abandoned timber-crib ore dock. It was necessary to remove the old ore dock before beginning construction on the new coal dock which occupies a similar position, about 66 ft. further away from the old coal pier. This provides a slip 900 ft. long, 200 ft. wide and 22 ft. deep between the two coal docks, which is ample to allow two of the largest boats used in this service to be loaded simultaneously, and ordinarily one other boat will be able to anchor along each dock face while awaiting a cargo. Additional anchorage for empty boats is provided on the rear of the new dock, where a slip 15 ft. deep, 150 ft. wide and about 540 ft. long, has been dredged.

The old yards, containing five tracks and two tracks respectively, have been enlarged to a capacity of 200 loaded cars and 100 empty cars. A similar capacity is provided in the yards serving the new dock, which have nine tracks and three tracks respectively. The grade in the new load yard rises to a summit about midway of its length and then descends at the rate of 1.5 per cent compensated to the haulage car pit. This pit, as shown in the plan, is located between the load yard and the dumper so that the loaded cars are pulled up the 11 per cent grade to the cradle of the car dumper without reversing their direction. After the cars have been dumped they run down the 4.4 per cent grade to the switchback on the end of the pier, reverse and run down the 1.5 per cent compensated grade to the empty yard. Riders control the speed of the cars throughout these movements. This system of handling cars is commonly termed "direct" in distinction to the track layout known as "indirect" which is used on the old dock and in which the loaded cars move from the load yard down an inclined track past the car dumper to the switchback, and then over the mule pit, from which they are pushed up to the dumping machine. The empty cars run by

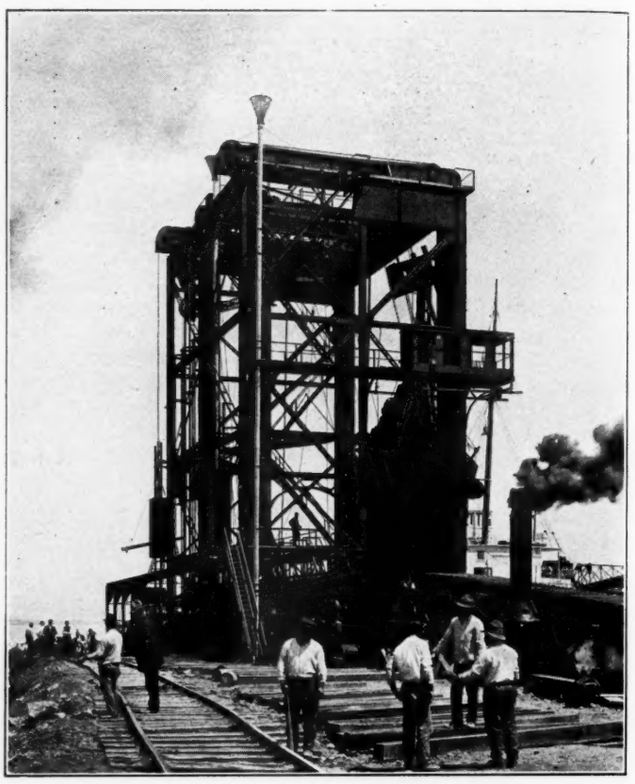


Plan, Profile and Details of New Pennsylvania Coal Dock at Sandusky, Ohio

gravity from the machine directly into the empty car yard. The principal advantage of the direct system in this case is that the length of the trestle on the dock, which is required to carry loaded cars, is less than in the other system. The approach and run-off on either side of the dumper are Pennsylvania standard wooden trestle.

An increase in the working capacity of the dumper has been secured by raising the rail on the cradle to an elevation 25 ft. above water level, which is 8 ft. above the corresponding point on the old dumper and somewhat higher than is usually adopted for such machines. The obvious advantage of this change is that the cradle need not be lifted through so great a height, and in consequence, the complete movement can be made in a shorter time. However, this change requires the mule engine to raise the loaded car through a greater distance, and if this operation cannot be made rapidly enough to place a loaded car on the cradle as fast as it can be returned to position, the theoretical advantage will be lost. The capacity of the "mule" has been increased over ordinary practice in two ways, first by increasing the size of the engine used, and second, by attaching a tail rope to the "mule," which allows the same engine to pull it rapidly down, the grade into the pit. It is usually found that even though the mule engine can pull the car up the grade at a satisfactory rate, some time is lost in waiting for the "mule" to run down again by gravity, and occasionally a loaded car coming down from the load yard passes over the pit before the "mule" has reached it, causing additional delay.

The concrete dock wall is supported by 1,045 ft. of timber crib 21 ft. wide and 15 to 22 ft. high. In addition to this, some cribs were built across the closed end of the slip and under an extension of the old dock. The post cribs which were used for these foundations were built up of 12-in. by 12-in. hemlock timbers, with a center wall and cross tie walls 9 ft. center to center, with eight 12-in. by 12-in. posts at each tie wall. The typical pockets have interior dimensions of 9 ft. by 8 ft., and are floored with 3-in. plank. All timbers are securely tied together by 1⅛-in. drift and staybolts. The cribs are anchored to bed rock by 4-in. car axles extending through the floor of the crib into holes drilled about 3½ ft. into the rock at intervals of 9 ft. The outer half of the crib is covered by a solid floor on which the forms for the concrete dock wall were built. This wall has a bottom width of 10 ft. and a height of 10 ft. above the top course of the crib timbers. The face of the wall is vertical, with two waling strips for protection against damage by boats landing along the dock, and the back is stepped into a top width of 6 ft. Cast iron mooring posts are anchored in the surface of the wall at intervals of 40 ft.



The New Coal Dumping Machine Just Before Its Completion

The car dumper machine and the mule house are carried on

General View of New Dock with Old Dock at the Right

reinforced concrete columns extending down to rock. The four columns under the front of the dumper are within the limits of the crib, and in these cases the crib walls were so located as to bring the columns in the crib pockets, enabling them to be built by framing off a portion of the pocket to be filled with concrete. The remaining 9 columns are 5 ft. 6 in. cylinders. All of the columns are reinforced with old rails and spiral bar reinforcement. The boiler house is carried on a fill inside wooden piling which is driven to rock, and the coal bunkers alongside the boiler house are of concrete. Three 200-h. p. boilers are provided with a coal bunker for each under the load track. A 126-ft. steel stack furnishes draft for the boilers. The boiler house, car dumper machine and mule house are covered with asbestos protected metal, and have windows of Fenestra steel sash. The car dumper is of the Hulett type, furnished by The Wellman-Seaver Morgan Company, Cleveland, Ohio. It has a cradle 60 ft. 8 in. long, which is operated by an engine with two 22-in. by 24-in. cylinders, operating two drums. A similar engine is provided for the mule hoist.

One of the first steps in the construction of the new dock was the preparation of the foundation surface by divers working under the ice during the winter. All material overlying the solid rock was cleaned away and the surface of the rock was leveled by drilling off high portions and building up low ones. The bottom grillage, the four lower courses of wall timbers and all posts in the cribs were framed together at a dock about one-half mile away, and these sections of the cribs were towed to the site by tugs. They were launched into the proper position and sunk by building up the remaining timbers and filling the pockets. The concrete in the dock walls was placed from mixer plants located on scows.

The old slip was widened from 134 ft. to 200 ft., and dredged to a depth of 22 ft., requiring the removal of from 1 to 12 ft. of rock. A hydraulic dredge was also used to handle some of the pier filling and a small portion of the filling under the new yards when it became necessary to rush this portion of the work shortly before its completion. This dredging and the construction of the foundation crib and the dock wall was contracted to the Great Lakes Dredge & Dock Company, Cleveland, Ohio. H. E. Culberson & Sons, Cleveland, had the contract for making the fill under the new yards. They used two steam shovels and standard gage equipment to place about 200,000 yd. of quarry strippings. The work was handled under the direction of R. Trimble, chief engineer maintenance of way, and H. W. Petersen, engineer in charge.

SIGNALS FOR NEW BROOKLYN SUBWAYS

The New York Municipal Railway Corporation—the organization which is building the new subways, tunnels and elevated lines which are to be operated by the Brooklyn Rapid Transit Company in Manhattan and Brooklyn boroughs, New York City—has contracted with the General Railway Signal Company, Rochester, N. Y., for a complete equipment of automatic block signals, interlocking switches and signals, and automatic train stops and cab signals, the latter to have "speed control." The contract covers all of the lines forming this company's portion of the "dual rapid transit system" as laid out by the authorities of the state and city when plans were adopted last year for the additions to the present intramural railroad system. The length of road covered by the present contract is about 103 miles, and the length of main track signaled will be about 178 miles.

The first line to be equipped will be the Broadway-Fourth Avenue line in Brooklyn, a subway which has been under construction for several years past and which is nearing completion. This line will be operated in connection with the Centre street loop, in Manhattan, which is already in partial operation, with signals installed by the Federal Signal Company. Other lines will be signaled as completed, the whole contract taking two or three years.

The company first asked for bids on a system similar to that in use on the Interborough Rapid Transit, which includes an automatic train stop; but about the time the bids were opened, the General Railway Signal Company proposed for consideration a scheme making use of the speed control feature for the automatic stopping apparatus, and electrical (instead of mechanical) apparatus to perform the special functions of this system. This alternative plan was finally favored both by the railroad company and by the Public Service Commission, which acts for the city, the owner of the lines in question; and a new contract was drawn providing for the introduction of the new system. The automatic stop, cab signal and speed control system will be at once installed on a short section, to demonstrate its reliability; and its final acceptance will depend upon its giving service satisfactory to the road and to the Public Service Commission; but in the meantime, the other signaling work will go on, and apparatus will be installed as the tracks are made ready for operation.

With the complete system of automatic stops and cab signals, it is proposed to do without fixed roadbed signals, except at interlockings; and if any lines are ready for operation before the cab signal system shall have been perfected, the roadside signals can be put in, and used, and later taken out. "Light signals" will be used throughout, so that the disturbance or cost of making a change of this kind need not be great.

The General Railway Signal Company has not yet perfected its plans for the stops and the cab signals, but it is understood that it has acquired the patents of P. J. Simmen, of the Northey-Simmen Company, which has installed cab signals and kindred apparatus on electric lines in Canada, in Indiana, and in Tennessee.

In general, the speed control arrangement will be so operated as to give the motorman two warnings before reaching a spot where the brakes will be automatically applied; first a yellow light (in place of the green, or all-right light, which glows in the cab under normal conditions); this at a ramp fixed on the track far enough back to allow for bringing a train to a stop from full speed; next an audible signal from another ramp, giving time for the application of the brakes. If this second warning is disregarded the brakes will soon be applied and the propulsion current will be cut off. The speed indicator on the engine or car actuates a control apparatus which is constantly self-adjusting, throwing the brake-setting apparatus into condition to be operated whenever the speed exceeds the prescribed limit and throwing it again when the speed has been properly reduced. It is designed to make use of the system not only at the approach to switches and stations, but also approaching sharp curves.

With speed control apparatus in operation, the overlap, as employed on the Interborough subway lines will not be necessary; and with this improvement the capacity of a track can be increased from 15 to 20 per cent; or, where track capacity is limited by the time consumed at station platforms, the block signal sections can be made correspondingly longer and less expensive.

The Public Service Commission of the state, in announcing its approval of this contract, gives the total amount as $1,413,000. This, however, apparently includes a contingent sum for the installation of apparatus on the cars, the number of which is to be 1,600. The total amount of the contract for roadway apparatus, which includes automatic block signaling, interlocking, and the necessary stopping apparatus on the track is $1,293,000.

The bid of the General Railway Signal Company under the first specifications was $1,808,676, while that of the Federal Signal Company was $1,392,833. When the new bids were opened the Federal Company, whose bid was higher than that of the General, protested that the action of the company and of the Public Service Commission was irregular and unwarranted. There was long discussion and delay on the part of the Public Service Commission and the approval of the contract finally was carried in the commission by a vote of three to two. The protest of the Federal Company has been renewed before the commission, but so far without result.

The chief engineer of the New York Municipal Railways is W. S. Menden, and the signal engineer is R. C. Johnson, formerly in the signal department of the New York Central.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS

The winter meeting of the Association of Transportation and Car Accounting Officers was held at Richmond, Va., December 8 and 9, with 102 members in attendance, and President J. M. O'Day in the chair.

Mayor Ainslie welcomed the association to Richmond, and, speaking of what he had read in the newspapers about railroad men, said he was surprised to see such an aggregation of sincere and honest looking men.

The executive committee recommended that it be authorized, in conjunction with any standing committee, and in its discretion, to meet the representatives of the American Railway Association and recommend uniform practice under existing rules. This was approved.

A recommendation of the executive committee that the committee on conducting passenger transportation, committee on conducting freight transportation, and committee on joint interchange and inspection bureaus be combined, temporarily, was approved.

The association concurred in a recommendation of the committee on car service sustaining the practice of requiring the delivering carrier to show the date of original receipt of cars offered in interchange when the record of delivery is one year or more old.

The association concurred in the action of the committee in disapproving the proposed amendment to car service Rule 10, which reads:

> When on account of bunching in transit upon a carrier line a switching line must cancel or refund demurrage, it may reclaim on the carrier line a number of days at the current per diem rate equal to the number of days for which such demurrage has been canceled or refunded.

As bunching is not considered under the average agreement, which applies to a large percentage of cars handled in terminals, the cancellation or refund of demurrage would not be a material factor. It would be difficult to determine responsibility for such reclaims, if allowed.

The recommendation of the committee on car service against the inclusion of an amendment to Rule 10, code of car service rules, providing "that where there is a demurrage item involved that the date the papers are taken up with any department of the erring line be accepted as the opening date of the per diem claim," was concurred in by the association. The committee on car service in reporting against this proposed amendment to Rule 10, advised that in its opinion the protection of per diem reclaim where demurrage is involved as a result of carriers' error is within the power of each transportation department.

The recommendation of the committee on car service that unless special arrangements are made by owners, empty railroad-owned tank cars will be handled under car service rules 1 to 4, inclusive, was concurred in.

By recommendation of the committee, action was taken rescinding the amendment to car service rule 15, which was approved in June, 1913. This amendment provided that the delivering road shall pay the cost of transfer or rearrangement when transfer is necessary for the protection of perishable freight against weather conditions. The present action maintains the integrity of the rule in its present form.

The recommendation of the committee that car service rule 3, paragraph f, be amended was adopted by the association for submission to the American Railway Association. The rule as it stands at present requires the consent of the owner in order to short-route a car at the reciprocal rate named therein. The amendment makes the consent of the owner unnecessary.

The findings of the committee on car service with regard to the establishment of committees on conference and co-operation were concurred in by the association, and ordered sent to the American Railway Association. This plan was proposed by Texas roads, and was the subject of a conference at which all parts of the country were represented. At this conference the Texas men made it clear that advantages have already accrued from such co-operation as is proposed. Instances were related of short routing of empty cars, in some cases reciprocal, and in other cases the service being performed by one carrier for another at the reciprocal rate provided for in car service rule 3f. The Sunset Central Lines and the International & Great Northern have made an agreement, under which the cars of the two roads are to be used in common. By establishing these conference committees in the several territories, opportunity will be afforded to discuss in an informal way their problems and perplexities with a view to securing co-operative effort. The committee recommends that the personnel of these committees consist of those directly responsible for the handling of cars; that during the first three months there will be no attempt to inaugurate a method of general authoritative supervision over cars, and that the committees be formed so far as possible along the natural territorial lines, such as will correspond to present traffic organization territories.

The committee on continuous home route cards made a report embodying answers which have been made to inquiries received concerning the handling of cars under a continuous home route card. The loading and forwarding road is responsible for putting on a card. A car loaded with perishable freight should always be accompanied by an owner's universal home route card. Any foreign car offered should always be accompanied by an owner's universal home route card. In the event of the loss of owner's home route card, the offering road must deliver a home route card of its own issue, and the offering line is responsible for obtaining and forwarding a duplicate owner's home route card to the agent at billed destination. To make the use of the owner's universal home route card mandatory it will be necessary to amend service rule 5. The principles embodied in these suggested answers were concurred in by the association.

The list of accepted assignments of reporting marks to cars of railroad ownership, presented by the committee on office methods and accounting, was adopted for submission to the American Railway Association. Approximately 400 railroads have accepted assignments of reporting marks and are using them. A list of accepted assignments of reporting marks for cars of private ownership was adopted for submission to the American Railway Association. Approximately 350 owners of private cars have accepted marks assigned.

The recommendation of the committee that all car owners indicate in their respective registrations the reporting marks which are applied to the equipment so registered, and that if consistent The Official Railway Equipment Register set forth this information in the indexes, was concurred in by the association.

The association approved a proposed amendment to Rule 1, code of per diem rules, so as to provide that the penalty rate of five cents per car per day be applied to all delayed per diem settlements, even though the per diem has been reported in error to another road.

The report of the committee on office methods and accounting, opposing the adoption of a form for correction of interchange report, embodying the self-transcribing or cut-up principle was concurred in by the association.

The recommendation of the committee on handling railroad business mail that all mail, whether forwarded via United States post or by railroad business mail, include the name of the department, name of railroad in full, city, state, full information as to local street address, title of officer, name of officer, etc., as each particular case may warrant, was concurred in by the association.

The recommendation of the committee on conducting passenger transportation that all railroads be called upon to show in The Official Railway Equipment Register information in every respect relating to passenger equipment cars, was adopted by the association for submission to The American Railway Association.

It was decided to hold the next meeting of the association at Niagara Falls, June 22-23, 1915.

One Year's Electrical Operation of the B. A. & P.*

Train Loading Was Increased 33 Per Cent, Savings in Operating Expenses Equaled 20 P. C. on Investment

By J. B. Cox

The Butte, Anaconda & Pacific was built in 1892 principally for the purpose of conveying ore from the mines at Butte to the Washoe smelter at Anaconda, 26 miles west of Butte. The tracks connecting Butte and Anaconda constitute the main line, which is approximately 25.7 miles in length. As the mines are mostly around the top of Butte Hill and the shafts through which the ore is hoisted to the surface are scattered over a considerable area, yards were built at a convenient point on Butte Hill for the concentration of the cars containing the ore from these shafts, as well as to serve as a distribution point for the supplies to the mines; a branch locally known as the Missoula Gulch line was built from these yards to connect with the main line at Rocker, where yards were also established.

Since the concentrator at the smelter is also on a hill at an elevation of approximately 340 ft. above the main line, it was advisable to establish another yard at East Anaconda from which to distribute the ore and other supplies to the different centers on Smelter Hill. The lines from these yards at East Anaconda to the smelter are known as the Smelter Hill lines, the longest branch of which is that leading to the concentrator, which is about 7¼ miles in length. Two spurs lead from this main track, one to the stock bin yards and the other to the copper tracks.

From the Butte Hill yards spur tracks radiate about Butte Hill to the shafts of the various mines and other points where supplies are to be delivered. The ore is loaded into hopper-bottom steel ore cars of 50 tons capacity, which are delivered to the Butte Hill yard, where they are made up into trains and taken down to the Rocker yard, where they are made up into still larger trains and taken over the main line to the East Anaconda yard. Here the trains are broken up to be transported in smaller units up Smelter Hill to the concentrator yards. Thus practically all of the ore cars are handled by five different engine crews between the ore bins at the mines and the receiving bins at the concentrator.

A total of 27 steam locomotives was owned by the railway company, classified as follows: Switching, 7; Consolidation, 8; Mastodon, 10, and passenger, 2.

The coal used on the steam locomotives was obtained from the mines at Diamondville, Wyo., and had to be transported approximately 395 miles for delivery to the bins of the railway company, at which point its average cost was approximately $4.25 per ton.

Most of the machinery at the mines and the smelter had been electrified, and the results had been so satisfactory that the railway company made a study of conditions for the purpose of investigating the advantages that might be expected from the electrification of its lines, the result of which was the placing of a contract in December, 1911, for the electrical equipment of the main line, with spurs and yards between Butte and Anaconda, the Missoula Gulch line between Rocker and Butte Hill yards and the Smelter Hill lines. Owing to local conditions on the spur tracks leading to the various mines from Butte Hill yards, it was thought advisable not to electrify these until a later date. The tracks recommended to be electrified totaled approximately 90.5 miles.

Seventeen 80-ton electric locomotive units were purchased, originally, 15 of which are being operated in freight service and two in the passenger service. These units are practically interchangeable with the exception of the gearing, the passenger locomotives being geared to operate normally at 40 or 50 miles per hour, while the freight locomotives are geared to operate at from 15 to 25 miles per hour, the maximum free running speed being approximately 35 miles per hour. The continuous tractive effort of the freight units is 25,000 lb., at 15 miles per hour, but they are capable of exerting a maximum tractive effort of 48,000 lb. for five-minute intervals, based on a coefficient of adhesion of 30 per cent.

All the locomotive units are of the articulated, double-truck type with twin gears mounted on projections provided on the wheel centers for the purpose, and in general mechanical design are similar to the electric locomotives in operation on the Great Northern, the Detroit River Tunnel and the Baltimore & Ohio.

Work on the electrification began in the spring of 1912, and the first electric locomotive was run in Anaconda on May 14, 1913, about a year later. On May 27, two ore trains were hauled up Smelter Hill on trial trips with electric locomotives and on the following day a double-unit electric locomotive took over the regular day service of hauling the ore from East Anaconda yards to the concentrator yards, a distance of approximately seven miles, with a ruling gradient of 1.1 per cent compensated, and the grade fairly uniform through the entire distance. The steam locomotives used in this service were of the Mastodon type, weighing 108 tons, 83 tons of which was on the drivers. The weight of the tender loaded was approximately 55 tons, making the total weight of locomotive and tender about 163 tons, which would average close to the weight of the double-unit electric locomotive superseding it. The steam locomotive ordinarily made six round trips per shift, hauling 16 loaded ore cars per trip, or 96 cars per shift.

The average time required by the steam locomotive for the trip from East Anaconda to the concentrator yards with 16 loaded cars was about 45 minutes. The double-unit electric locomotive began taking 16 cars per trip but made 8 trips per shift, delivering 128 cars per shift. The average time for the up-hill trip with the electric locomotive was about 22 minutes or approximately half the time required by the steam locomotive for the same number of cars. Empty cars were taken to East Anaconda on the return trip, which, being all down grade, gave the electric locomotive no decided advantage, as the speed in either case was limited to about 25 miles per hour for safety. The number of cars hauled per trip was kept the same with the electric locomotives in the beginning as it had been with steam, as it had been decided to make the change-over by gradually replacing one steam locomotive at a time with an electric, taking the engine crew off the one and placing it on the other, thus breaking them in on the electric locomotives in regular service. One of the regular steam engineers had been given special instructions on the electric locomotives during the experimental running in order that he might become competent to act as instructor to the other engineers until they were sufficiently familiar with the electric locomotives to be left alone.

The load per trip in this service was gradually increased from 16 cars to 25 cars, which is to be the standard for the present. The average time for the up-hill trip with 25 cars is about 26 minutes, so that eight trips per shift are made easily, making a delivery of 200 cars possible or an increase of slightly more than 108 per cent over what had been possible for the same crew with steam locomotives. These loaded ore cars average from 70 to 72 tons each, making the

*Abstract of a paper presented before the Pacific Coast section of the American Institute of Electrical Engineers.

trailing load for a 25-car train from 1,750 to 1,800 tons.

On arrival at the concentrator yards the ore trains are taken by a switching engine called the "spotter," which places one car at a time over the weighing scales, after which they are rearranged for placement over the concentrator bins. On June 20 this spotting service was taken over by a single-unit electric locomotive and on July 2 the night service up Smelter Hill was taken over by the double-unit electric locomotive. The steam locomotive used for the spotting service was of the Consolidation type and weighed 93 tons, 83 of which was on drivers, the tender weighing loaded 62 tons, making the total weight of engine and tender 155 tons. The steam locomotive used in the night service on Smelter Hill was similar to that used in the day service. When the electric engines were put on the night service all the handling of ore between East Anaconda and the concentrators was done electrically, and the hauling capacity per crew was so much greater that it was no longer necessary to have a "spotter" crew on the night shift so that this crew was eliminated, and the night crew hauling the ore up Smelter Hill did the spotting on arrival at the concentrator yards, it being no longer necessary to make the regular number of trips. Thus where formerly four engine and train crews had been required during steam operation three similar crews were able to do the same work with electric locomotives in less time.

On October 1 regular passenger service between Butte and Anaconda was taken over for electrical operation. The steam locomotives used in the passenger service weighed approximately 80 tons, 60 tons of which was on the drivers, while the tender loaded weighed 52 tons, making the total weight of engine and tender 132 tons. The distance between Anaconda and Butte is 25.7 miles, and the schedule time for the trip, one hour. No change has been made in this time, though a reduction of 20 per cent would be possible with the electric locomotives were such desired. It may be of interest to note that on the day shift, averaging four trips per day, during the first five months the passenger train did not come in late a single time on account of engine trouble.

On October 10 a double-unit electric locomotive was put in the day freight service on the main line between East Anaconda and Rocker, a distance of 20.1 miles. The steam locomotive replaced in this instance was of the Mastodon type, weighing 103 tons, 77 of which was on the drivers, while the tender loaded weighed 55 tons, making the total weight of locomotive with tender 158 tons. The standard train hauled on the trip west was 50 to 55 loaded ore cars weighing approximately 3,500 to 4,000 tons gross and the average running time of such trains where no stops were made was about 1½ hours, corresponding to an average speed of approximately 13.4 miles per hour. In the beginning the electric locomotive took only the standard train, but made the trip without stop in about one hour, corresponding to an average speed of 20 miles per hour. The ruling gradient on the westward trip is 0.3 per cent and about half the distance is down grade. On the 0.3 per cent grade with a 55-car train, the steam locomotive made about 7 miles per hour. The electric locomotives with similar train now make about 16 miles per hour on the same grade.

The weight of the trains hauled by the electric locomotives on this run has been gradually increased up to 65 loaded ore cars averaging about 71 tons each, making the gross weight trailing about 4,620 tons. Adding 160 tons for the weight of the double-unit electric locomotives and 20 tons for the caboose makes a gross train weight of approximately 4,800 tons.

The remainder of this main line freight service was gradually taken on during the months of October and November. As many as 76 ordinary freight cars loaded with coal, coke and general merchandise have been taken in a single train on the westbound trip and 85 empties are frequently taken from East Anaconda to Rocker eastbound, the ruling grade being 1 per cent.

Comparative results of the month of June, 1913, with steam operation and for the same month of 1914 with electrical operation of this main line service, show that with a slight increase in the total tons of ore hauled the average tons per train was increased from 1,761 to 2,378, or 35 per cent, thus decreasing the average number of trains per day from 12.5 to 9.3, or 25.6 per cent. The average time per trip during steam operation was approximately 2 hr. and 25 min., while with the electric locomotive it was approximately 1 hr. and 45 min., showing a decrease of 40 min., or 27.5 per cent. The overtime in this service has been decreased 73.5 per cent and the total time 42 per cent, resulting not only in greater economy to the railway, but in shorter and easier hours for the crews.

The service on the Missoula Gulch line running between Rocker and Butte Hill yards was taken over for electrical operation on October 20. This line is 4.5 miles in length and the ruling gradient 2.5 per cent. The steam locomotives used on this line were of the Mastodon type, weighing 106 tons, 87 tons of which was on the drivers, the tender loaded weighing 56 tons, thus making the total weight of engine and tender 162 tons. Two complete crews had been required to handle this service during steam operation, averaging six trips per day each. A single crew with a double-unit electric locomotive has been doing this work successfully. Thirty-five to 45 loaded ore cars are taken down from Butte Hill yard to Rocker, and about an equal number of empties taken up. In addition to the empties, large quantities of timber and supplies for the mines are delivered over this line.

On November 25 the last of the electric locomotive units went into service, thus completing the electrification originally intended. The full electrical service has, therefore, now been in operation more than nine months and that on Smelter Hill more than 15 months.

This was the first installation of 2,400-volt direct-current apparatus for the operation of a railway in this country, 1,500 volts being the highest heretofore installed for such a purpose.

The total saving from locomotive performance alone is at the rate of $237,581 per year, to which should be added the credit of handling an increase of traffic at the rate of 13,938,136 ton-miles per year or 8.77 per cent more than was handled by the steam locomotives during the period compared. To this saving from locomotive performance should be added the saving from trainmen's wages, which is at the rate of $31,146 per year, or a decrease of approximately 21 per cent, due largely to the elimination of overtime, making the total saving from these two items $268,728 per year. From this should be deducted $10,839 for maintenance of the distribution system, leaving $257,889 as the net operating saving per year due to electrical operation.

The roadmaster states that it is quite evident that the electric locomotives are much easier on the track at curves, but that there is no noticeable difference on tangent track, and that while sufficient time has not yet elapsed to form definite conclusions, present indications lead him to expect that any difference relative to his work will be favorable to the electric locomotives.

Arranging the items of expense in the order of usual appearance in the summary of a standard locomotive performance sheet, and placing them on a yearly basis, results as follows:

Item of operating expenses	Steam, 1913	Electric, 1914	Decrease, 1914	Per ct. dec.
Fuel and power	$315,235.74	$164,508.70	$150,727.04	47.81
Repairs	124,787.90	92,278.08	32,509.82	26.05
Enginemen's wages	104,461.18	71,225.88	33,335.30	31.81
Enginehouse expenses	29,907.80	18,638.38	11,269.42	37.68
Water	4,953.66	1,193.70	3,759.96	75.90
Lubricants	9,751.44	4,942.32	4,809.12	49.30
Other supplies	5,823.52	4,552.36	1,271.16	21.83
Total locomotive performance	$594,921.24	$357,339.42	$237,581.82	39.93
Trainmen's wages	147,632.30	116,486.00	31,146.30	21.10
Grand total	$742,553.54	$473,825.42	$268,728.12	36.19
Ton miles hauled	158,917,720	172,855,856	13,938,136*	8.77*

*Increase.

The total cost of the electrification, including a change of signal system on Smelter Hill, an extra motor-generator set recently installed at Anaconda, interest during construction and all incidentals due in any way to the electrification, was in round numbers $1,201,000. This does not include the step-down transformers, which are the property of the power company, but on the other hand no deduction has been made for the salvage due to the elimination of 20 steam locomotives.

ANTHRACITE COAL RATES REDUCED IN PENNSYLVANIA

The Pennsylvania Public Service Commission, in a decision issued December 21, announces that it will order a sweeping reduction in the rates for the transportation of coal from the Schuylkill, Lehigh and Wyoming regions to Philadelphia, all rates being reduced substantially to the basis on which the railroads carry coal to Philadelphia for shipment by water to New England and other points; in most, or all, cases 40 cents a ton. The order reduces the rates on all sizes of coal except those smaller than pea, the rate for these smaller sizes to be the same as that for pea. The roads affected are the Philadelphia & Reading and the Pennsylvania; and, in a lesser degree, the Lackawanna, the Central of New Jersey and the Lehigh Valley. The complainants were numerous organizations of citizens and business men in Philadelphia.

The date when the order is to take effect is not given.

The present rates for prepared sizes of coal per ton of 2,240 lb. by the Reading are, from the Schuylkill district, $1.70; from the Lehigh district, $1.86, and from the Wyoming district, $2.10. The rates for pea coal and smaller sizes are considerably less; and the average reduction is estimated at 25 to 30 per cent.

The report recounts the history of the coal traffic from the year 1825, when it began to be recorded, moving at first by canal. The Reading, the largest carrier, transported in 1912 a total of 11,224,945 tons altogether; and the change now ordered is said to affect about 40 per cent of this total. The average distance over which the Schuylkill coal travels to Philadelphia is 121 miles. The average of all shipments over the Pennsylvania Railroad is 189 miles.

The commission finds that the Reading owns or controls 44 per cent of the unmined anthracite coal; the Lehigh Valley 17 per cent; the Lackawanna 7 per cent, and the Central of New Jersey 19 per cent. Other particulars concerning ownership, etc., are recounted.

At the outset, says the commission, there is a presumption against the propriety of the continuance of the existing rates. All of them have stood unchanged for 17 years, and some of them for 40 years, during which time the cost of transportation has been affected by great changes, such as the increase in the size of cars and of engines, the volume of traffic, etc.

Accountants engaged by the commission examined the books of the railroad companies and found that the cost of transportation, not including any return on bonds or stock, in the year ending May, 1913, over the Reading road, for 123 miles, was 45 cents a gross ton; over the Pennsylvania, for 187 miles, 61 cents; and various rates from 49 cents to 77 cents over other routes.

Comparisons also are made with the rates charged for carrying bituminous coal over these and other roads, all of which are much lower. Counsel for the Reading gave figures showing that in 1912 that road's rate per ton per mile on anthracite coal was 8.599 mills, this being a little less than the average for the preceding five years; while the rate per ton per mile on all freight was a little over 7 mills.

The railroads admitted that the rates for the transportation of coal to be sent out from Philadelphia by water, much lower than the Philadelphia rates, were not unprofitable. The final conclusion of the commission is based mainly on the fact that the rates charged for coal going beyond Philadelphia are profitable. This decision, says the report, will put Philadelphia "on an equality with the other cities and ports of the country." The prescribed rates from the Schuylkill district are, for prepared sizes, $1.30; pea coal $1; smaller sizes $1; from the Lehigh region, prepared sizes $1.46; pea coal and smaller $1.16; from the Wyoming region, prepared sizes $1.70; others $1.33. Other rates are named for combination routes. Coal delivered by the railroads to barges on the Delaware and Schuylkill rivers, to be taken by them to Philadelphia docks, on which traffic the barges receive usually 25 cents a ton, must be carried through for the same rate.

LEHIGH VALLEY MONOPOLY SUIT DISMISSED

Judge Hough in the United States District Court at New York, December 21, dismissed the suit of the government, brought last March, against the Lehigh Valley Railroad, the Lehigh Valley Coal Company, the Lehigh Valley Coal Sales Company and others, in which it was charged that the commodities clause of the Interstate Commerce law and also the Sherman anti-trust law had been violated. Judge Hough holds, in substance that "No monopoly of interstate commerce is shown nor any attempt to monopolize. It is impossible to find any of the normal results of monopoly without also finding violations of the commodities clause—and none is discovered. As to restraint of trade in coal transportation—there can be no restraint without control, and since the railroad does not control the coal it carries it has no means of restraint."

Concerning the charge of the government that the coal sales company had acquired land and other property from the coal company at ridiculously low prices, the judge says:

"What should or could be done with the lands and the coal on hand? And how could the concern retiring from the selling business insure the creation of a strong and pushing successor? Certainly not by hostility. Who would or could occupy and use the storage plants except the coal sales company?

"The assertion that the prices were ridiculously low is untrue. It was praiseworthy and lawful at first to sacrifice much in price when the object was to save from further assault the business of selling coal for interstate transportation. . . . The Lehigh Valley Railroad has not, since the filing of this bill or for some time before, been engaged at all in the selling of coal to the consumer. Union of such companies through stock ownership is not unlawful, provided there is a dissociation in good faith between the bona fide corporations. Dissociation in good faith requires no more than honest conduct of honest men. . . ."

The government had contended that the railroad and the other defendants had a monopoly of the coal industry in the territory tributary to the lines of the road; but the acreage thus controlled by the coal sales company, the court points out, is only a very small proportion of the entire anthracite acreage tributary to Lehigh Valley lines.

"This doctrine of territorial units is a novelty which I do not think bears investigation," says the judge, "for all that it does or can amount to is this, the coal lands are lawfully owned; the coal therefrom is lawfully carried; there is an actual and honest dissociation of interests between coal owners and carriers. The relations which are complained of have therefore no influence upon interstate commerce, for said relations begin, exist and end within the limits of the state.

"As to the commodities clause I shall dismiss the point with the statement that there is no great difference between what the Lackawanna did and was upheld in doing by the entire Circuit Court of the Third Circuit and what the Lehigh Valley has been doing as shown in this case. . . . The Lackawanna owned outright much if not most of the coal transported over its lines, whereas the Lehigh Valley owned the stock of other corporations which under the laws of Pennsylvania had good right to sell the coal, the transportation of which has given rise to so much litigation."

The government will appeal the case to the Supreme Court.

THE INFLUENCE OF CARBON ON THE PROPERTIES OF RAILS

An investigation of the influence of carbon on the properties of rails, such as ductility, stiffness, tensile strength, and the resistance of the rail head to flow of metal under rolling wheel loads, has been made under the direction of M. H. Wickhorst, engineer of tests, Rail Committee, American Railway Engineering Association, and published as Appendix A of the report of that committee in bulletin No. 170. The following is an abstract of this report:

A series of open-hearth rails was made with carbon varying from 0.32 per cent to 0.97 per cent, and they were tested by means of drop tests, tension tests, slow bending tests, transverse tests of the base and rolling tests under a loaded wheel. The material and all the facilities for this investigation were furnished by the Carnegie and Maryland Steel Companies. The material and rails were made by the Carnegie Steel Company at Homestead and Braddock, Pa., and the tests, except the rolling tests, were made by the Carnegie Steel Company. The rolling tests in a "reciprocating" machine were made at Sparrows Point, Md., by the Maryland Steel Company.

According to these tests the shrinkage of the hot rail after sawing increased an average amount of about 0.013 in. for an increase of carbon of 0.01 per cent, in the standard length of 33 ft. There were, however, some uncertainties and more data is needed with special reference to the relationship of carbon and shrinkage. The deflection of the rails in the drop test under the first blow decreased as the carbon increased up to about 0.85 per cent carbon, after which its decrease was at a slower rate. The rails were 80-lb. A. R. A. type-A section, and with 0.50 per cent carbon the deflection of the side that was below in testing was about 1.70 in. under a drop of 15 ft. With these conditions, the deflection decreased an average of 0.0188 in. for each 0.01 per cent increase of carbon. The relation found between carbon and elongation in the drop test is shown by the following formula:

$$E_{bt} = 35 - 30\ C$$

where E_{bt} equals the per cent elongation when the base is in tension, and C equals the carbon in 0.01 per cent.

The rails were tested as beams in the test-machine with a span of 3 ft. The breaking load increased as the carbon increased. The elastic limit increased with increase of carbon up to about 0.85 per cent carbon and then remained about the same. The elongation in this slow bending test decreased as the carbon increased and averaged a little less than in the drop or impact test. The yield point and tensile strength in the tensile tests increased with increase of carbon up to about 0.80 or 0.85 per cent carbon after which they remained about the same. The elongation and reduction of area decreased as the carbon increased and fell off to zero at about 1.00 per cent carbon or a little above. The average tensile strength developed in these tests may be expressed by the following formula for carbon between 0.30 and 0.80 per cent:

$$T = 40{,}500 + 1{,}250\ C$$

where T = tensile strength in lb. per sq. in. and C = amount of carbon in 0.01 per cent. The average yield point developed may be expressed by this formula, for carbon between 0.30 and 0.85 per cent:

$$Y = 30{,}000 + 400\ C$$

where Y = yield point in lb. per sq. in. and C = carbon expressed in 0.01 per cent.

The average elongation found in tensile test specimens with a ½-in. diameter and 2-in. gage lengths was about as shown by the following formula, for carbon from 0.30 to 1.00 per cent:

$$E = 40 - .38\ C$$

where E = elongation in per cent and C = carbon in 0.01 per cent. The average elongation found in the tensile test as related to the tensile strength, may be expressed by the following formula, for tensile strengths between 80,000 and 130,000 lb. per sq. in.:

$$E = 52 - \frac{T}{3{,}300}$$

where E = elongation in per cent and T = tensile strength in lb. per sq. in. The several formulas given above apply to open-hearth steel with about 0.03 per cent phosphorus and about 0.70 per cent manganese. They represent the average of the results obtained and individual results may vary above or below these averages.

In transverse tests of the base, the breaking load increased with increase of carbon up to about 0.80 per cent carbon and then remained about the same. The transverse elongation and the sag of flange decreased as the carbon increased. Tests were made to determine the resistance of the rails to flow or side spread of the head under rolling wheel loads. The tests were made in a "reciprocating" machine in which a piece of rail is made to move to and fro under a wheel that may be loaded as desired by means of a lever arrangement. The resistance to spread of head increased with increase of carbon up to about 0.80 per cent carbon and then remained about the same. In conclusion it may be said that in this series of rails varying in carbon from 0.32 to 0.97 per cent, the strength and resistance of the steel in the several tests, including the rolling tests, increased with increase of carbon up to about 0.80 or 0.85 per cent, and then remained about the same. The ductility decreased continuously with increase of carbon.

FEDERAL GOVERNMENT BOILER INSPECTION REPORT

The third annual report of the chief inspector of locomotive boilers of the Interstate Commerce Commission has recently been made public. This report is for the fiscal year ended June 30, 1914, and is signed by Frank McManamy, chief inspector of locomotive boilers. There were 92,716 locomotives inspected in 1914, 90,346 in 1913 and 74,234 in 1912. Of those inspected 49,137 or 52.9 per cent were found defective in 1914; 54,522 or 60.3 per cent were defective in 1913 and 48,768 or 65.7 per cent in 1912. In 1914 there were 3,365 locomotives ordered out of service, in 1913 there were 4,676 ordered out of service, while in 1912 there were 3,377 ordered out of service. The report states, however, that this does not fully show the improved condition resulting from the operation of the law, as when the law first went into effect the attention of the department was concentrated on the more serious defects so that the number of fatalities might be reduced. The improvement is more accurately indicated, therefore, by the reduction in the number of casualties as shown in the accompanying table:

	1914	1913	1912
Number of accidents	555	820	856
Decrease from previous year..per cent	32.3	4.2	...
Decrease from 1912.....per cent	35.1	...	...
Number killed	23	36	91
Decrease from previous year..per cent	36.1	60.4	...
Decrease from 1912.....per cent	74.7	...	...
Number injured	614	911	1,005
Decrease from previous year..per cent	32.6	9.3	...
Decrease from 1912.....per cent	38.9	...	...

Of the total number of killed and injured, 86 per cent were engine and train men, these accidents being caused by failure of some part of the boiler or appurtenances while in service; 13 per cent of these casualties were caused by failures due to low water where no contributory cause could be shown to exist. Of the total number killed and injured 3 per cent were boilermakers who were engaged in making repairs to boilers under pressure; about 50 per cent of these casualties were due to plugs, studs, or rivets blowing out or being driven into the boiler while being calked with pressure on the boiler. To reduce the number of accidents from this source, it is now being required that all plugs more than 1¼ in. in diameter in firebox sheets, excepting fusible plugs, be secured by a staybolt. Ap-

proximately 16 per cent of the injuries to boilermakers occurred while trying to tighten washout or arch-tube plugs while there was pressure on the boiler. The remaining 11 per cent of the total number killed and injured were from the various classes of employees engaged in the work of caring for and repairing locomotives at terminals.

Two formal appeals from the decision of inspectors, as provided in section 6 of the law, were filed during the year, in both of which a subsequent investigation resulted in the decision of the inspector being sustained.

No prosecutions for violations have been filed during the year, most railroad officers showing a disposition to comply with the requirements and to co-operate with the inspectors in bringing about improved conditions.

There were filed 406 applications for extension of time for removal of flues, in accordance with the provisions of rule 10, of which number 67 were withdrawn by the railroad companies before an investigation was made. An investigation was made in each of the remaining 339 cases, in 264 of which the full extension asked for was granted, in 21 an extension for a portion of the time asked for was allowed, and 54 applications, or 16 per cent of the total number, were refused after an investigation.

In accordance with rule 2 of the law, a careful investigation, extending over the two-year period allowed for filing specification cards was conducted and showed that 11,153 locomotives, or about 17 per cent of the total number for which specification cards were filed, had a factor of safety below 4, being divided as follows:

4,407 with a factor between 3¾ and 4.
2,531 with a factor between 3½ and 3¾.
2,039 with a factor between 3¼ and 3½.
1,082 with a factor between 3 and 3¼.
1,094 with a factor below 3, on some of which the factor was found to be below 2.

This matter was carefully considered at a conference held at the office of the chief inspector of locomotive boilers on April 28 and 29, 1914, at which the railroad companies and their employees were represented; and suitable amendments to the rules, providing for improved methods of construction and increased safety of operation, were agreed upon, to be submitted to the commission for its approval. It was also found that there were many locomotives in service with excessive stresses on stays and braces; therefore a maximum allowable stress for stays and braces was included in the amendments to the rules.

During the year, 2,141 defects to locomotives for which the present laws do not provide a remedy, 1,155 of which were defective wheels, were reported to this division by inspectors and directed to the attention of the proper railroad officers. In most instances locomotives with defects of this character were held for repairs by the local officers when their attention was directed to the defective conditions. In some cases it has been necessary to wire the president of the road in order to get the repairs made, and even that has not always brought about the desired result.

In one instance inspectors objected to the use of a locomotive in passenger service which had sharp flanges on both engine truck wheels, three driving wheels, and one trailer wheel, and also one loose driving wheel tire, and were assured by the local officers that the locomotive would not again be used until repaired. Instead of holding the locomotive for repairs, however, the local officers sent it light to a point a few miles from the terminal, sent a passenger train out to that point with another locomotive, and changed locomotives, sending the defective one through with the passenger train.

If a freight car with similar defects were offered to this carrier in interchange by a connecting line, it would be refused under its own rules as unsafe to handle; yet this defective locomotive was sent out on a passenger train by the officers after their attention had been directed to its condition, and existing laws provide no remedy.

The records contain other instances of a similar character; therefore, the recommendation made in the report for the year 1913, that the provisions of the boiler inspection law be extended to cover the entire locomotive is renewed.

In this connection it is stated that the inspectors now in the service are men of wide experience in railroad work, who were selected after passing a competitive civil service examination; and their three years' training as inspectors, in addition to their previous experience and training, has eminently fitted them to perform the additional duties that such a law would impose in as satisfactory a manner as they do their present ones.

THE WEIGHING OF LESS THAN CARLOAD FREIGHT

BY E. A. O'DONNELL
Traveling Agent, Sunset-Central Lines.

The time-worn adage: "What is everybody's business is nobody's business" is strikingly applicable to the past and present-day methods of l. c. l. freight weighing. In other words, a system permitting of optional performance, as relates to weighing, between carriers' representatives at originating and destination points, has resulted in a division of responsibility and consequent inability to control or assign individual responsibility. Owing to innumerable emergencies, the common carriers undoubtedly have been foremost in quest of efficiency. One channel, however, that of preventing duplication of work, apparently has escaped detection, as evidenced by the common manner of handling that portion of the transportation business with which this article deals.

The benefits to be derived by weighing less than carload freight at point of origin, as well as promptly upon its receipt, may be enumerated as follows:

As shipments at point of origin are necessarily complete as receipted for, weights then taken afford a substantial basis on which to determine the merits of claims for alleged subsequent loss from whatever source.

Weighing at point of origin insures a more detailed check as to the number of packages constituting the entire shipment, the handling of which in the course of weighing should materially assist in bringing to light cases of illegible or duplicate marking, improperly prepared or improperly described packages, etc.

It precludes the possibility of failure to promptly weigh packages subject to natural shrinkage.

It provides for actual rather than estimated weights for original insertion in revenue billing, eliminating the necessity for extension corrections at destination based on weight variation.

It permits of more expeditious delivery at destination.

It provides for more prompt and effective accomplishment of supervision.

In case weights are not taken at point of origin, and the physical movement of a shipment is followed by a claim for loss, the carrier is thrown into a state of perplexity, neither knowing nor being in position to determine the authenticity of the claim; whereas, had the shipment been weighed when originally tendered, such weight would immediately establish the extent of the carrier's liability for loss, and the claim might be more quickly and satisfactorily disposed of.

Another advantage which weighing at initial point will gain is the discovery of improperly prepared, described or addressed packages. This is the time when the discovery may be used to greatest advantage in the education of the shipper, who, either inadvertently or deliberately, tenders a shipment in such condition. And it will be granted that the continued and persistent educating of shippers by those who, because of business relations are best acquainted with such shippers, and at the time when they are virtually caught "with the goods," must result beneficially to the carriers through the medium of a reduction of claims made possible by the existence of such conditions.

The billing and revising clerks, however, have possibly been the heaviest contributors to lost motion under the present system

of permitting destination weighing of freight. While in many cases no attempt has been made by the forwarding station to obtain correct weights, the billing clerks have nevertheless been obliged to compute extensions on whatever fictitious weights might be inserted in the shipping order, and such computations, based on erroneous weights and being, as a natural result, inaccurate, are of necessity wholly discountenanced at destination in order to establish proper charges based on correct weights, the consequence being that the time and talent devoted to the primary computations represent time and talent unquestionably wasted, with the inevitable monetary loss to the interested carrier. It is safe to believe that the unnecessary expense involved in the operation of such a system, if universally adhered to by carriers, would be nothing short of astonishing.

Again, at the larger distributing centers, where by far the major portion of less than carload freight originates, carriers are, as a general rule, better equipped, both as regards labor and other facilities, than are they at outlying stations of lesser importance, where quite frequently agents are without assistance. Hence, again the advisability of weighing at forwarding point. In this connection very helpful assistance may be rendered the agent at the outlying point who may be without an assistant by placing him in a position to dispose rapidly of inbound less carload shipments at the time of arrival rather than subject them to the delay incident to weighing, with probable increased operating cost for additional assistance to perform such work.

And, lastly, the plan of weighing freight at point of origin affords a most simple method of supervision, as well as a prompt and reliable one, for those assigned to the work of guarding against failure to properly weigh less than carload freight.

In view, therefore, of the many advantages to be obtained, might it not be most beneficial, financially and otherwise, for all common carriers to adopt the system of weighing freight, for either local or interline movement, immediately when tendered for shipment, and by so doing to relieve each other of the now ever-present burden of doubt as to accuracy of weights indicated on billing, and of possible duplication of work with its resultant tendency toward inefficiency?

TO GET THE BEST MEN FOR COMMISSIONERS

George W. Anderson, who recently resigned as a member of the Massachusetts Public Service Commission, wrote to Governor Walsh a letter in which he discussed some principles that are of interest outside of the Bay State. He said in part:

". . . For this office I never was a candidate. I accepted it reluctantly and at substantial personal sacrifice. Chapter 616 of Acts of 1914, promoted and approved by you, requires the members of this commission to 'devote the whole of their time to the business of the commission.' This legislation marks a radical change in the policy of the commonwealth as to obtaining service on our numerous commissions. My duty to my family, to myself, to my office associates and employees, as well as to certain clients, absolutely prohibits me from retaining office under this new policy. This I told you last winter.

"This act became effective on July 1; I should then have resigned except for the fact that the New Haven Railroad declined to accept the act passed by our legislature . . . and that the public interest absolutely required that same common ground should be found upon which the federal government and the New Haven could not meet . . . As it has fortunately turned out, I have been able to be of some use in that matter; but there is now no sufficient reason for my remaining longer in the service of the commonwealth under existing conditions.

"Very likely my retirement may be in the public interest, as it is clearly in my own interest, but this new policy is so unsound, so undemocratic, that I take this occasion to signify my protest against it.

"The inevitable tendency of this legislation is to limit the commonwealth to filling places upon such commissions with men drawn from two classes:

"1. From those who by virtue of inherited or acquired wealth are financially independent. From this class some very excellent public servants have in the past been obtained; doubtless it will be so in the future. But democrats and progressives would not look with equanimity upon a public service commission—charged with the duty of regulating great corporations—dominated by men living easily upon inherited or acquired wealth.

"2. The commonwealth may draw in abundant numbers from men whose demonstrated earning capacity is less than the salary now paid public service commissioners. From this class also excellent service has been and will be obtained.

"But men dependent entirely upon the emoluments of office for the livelihood of themselves and of their families are almost certain to be constant, conscious (or unconscious) candidates for reappointment; they cannot live and act in an atmosphere of independence and freedom. They are, almost necessarily, continuously measuring the forces which make for or against their own continuance in office.

"The mere fact that the salary paid public service commissioners is as much as that paid to superior court judges, makes the situation no better. Appointments to judgeships are for life, with pensions provided for disability and old age. But the bench is a great career, and many of our ablest lawyers prefer it—with its honor, dignity, freedom from strife and from either poverty or riches—to the struggle and possibly larger prizes of the bar. But these short-lived appointments on commissions must necessarily be but episodes in the careers of men of real force and ambition.

"The importance of permitting this class of public servants to retain some outside business or professional work is not that such servants may have, during office, a larger income—it is that they may be independent—not anxious for reappointment—ready on any necessary and proper occasion to risk their official lives in defense of their convictions of what public duty requires.

"I cannot qualify in the class of men living easily on inherited or acquired wealth; I will not qualify in the class entirely dependent for livelihood, present and future, upon the emoluments of public office. . . .

"To get a strong public service commission, the state must either appoint for life or for long terms—as judges are appointed—or the field must be kept open, as it has hitherto been kept open, for those who retain outside business in order not to be overanxious for reappointment.

"Your new policy magnifies the importance of clerkly observance of office hours and minimizes the importance of vision, of sense of public need and public right, of independence of control of financial interests. It disregards the vital distinction between places in which mediocre administrative fidelity is the essential and places which call for the best there is in our best men. It would be far better to reduce the salaries one-half and keep the field open to men of genuine public spirit and independent earning capacity, rather than, by making the salary substantial, to increase the avidity and number of the job-hunters. . . ."

TRANSPORTATION OF FREIGHT VIA SIBERIA.—The Moscow Exchange is trying to secure a reduction in freight rates to points reached via Vladivostok, which, after December 1, is likely to be the only open Russian port. According to information received by the exchange from the Far East, the Ussuriisk Railway, controlled by the Chinese Eastern, has sufficient transportation facilities, especially from Vladivostok to Kharbin and Chitz, but its rates are considerably higher than those of most Russian railways. Since it is impossible to determine the time when normal conditions will be re-established, it is thought that it would also be advisable to propose similar reductions in the rates via Nikolaiefsk, the Amur river, and the new Amur Railway, on which freight traffic will begin with the opening of navigation.

General News Department

The two-story brick station of the Michigan Central at Michigan City, Ind., was destroyed by fire December 16.

The shops of the New Haven road were ordered closed until January 4, but now it is said that work will be resumed December 28.

Interstate Commerce Commission engineering parties have just begun their work on the valuation of the Atchison, Topeka & Santa Fe Coast Lines. They started at Williams, Ariz., and are working in both directions.

The forty or more railroad employees arrested last week at Pinner's Point (Norfolk) Va., for working at the freight station on Sunday, were fined five dollars apiece. The Southern Railway, acting in behalf of its employees, appealed the case to the Norfolk County Circuit Court.

The Interborough Rapid Transit Company, New York City, is distributing $43,000 to its employees in the shape of Christmas gifts of $5 each. It is said that these gifts will go to substantially all employees whose regular pay is less than $115 a month. This is the third time that such a distribution has been made.

W. A. Frick, fourth vice-president of the United States Steel Railway Tie Company, and John Maxey, also connected with the concern, were arrested in Pittsburgh last week on charges of fraudulent advertising, made by Attorney A. C. Stein. It is charged that "The United States Steel Railway Tie Company" exists only on paper, and is used to defraud victims. The Pittsburgh Publicity Association is back of the prosecution.

In the yard of the Boston & Maine at Somerville (Boston) Mass., about 2 o'clock on the morning of December 17, the police took into custody 118 tramps, who were found in passenger cars, where they had expected to spend the night in the comfortable atmosphere of the cars which was being kept warm preparatory to the use of the cars early the next morning; and on being searched at the police station, not one cent of money was found among the whole crowd.

Mr. Van Brunt, a safety-first lecturer of the Public Service Corporation, operating extensive electric car lines in New Jersey, says that practically all of the school children in that state, 400,000 of them, have listened to lectures on safety-first; and in the city of Newark the number of casualties to children in the streets has been decreased 47 per cent. Mr. Van Brunt says that in conducting the safety-first propaganda oral lectures have decided advantages over printed matter.

William G. Lee, president of the Brotherhood of Railroad Trainmen, has announced the program of legislation which the brotherhood is preparing to advocate in Congress and in the state legislatures. Mr. Lee says it is proposed to ask the state legislatures to pass a car limit law, to fix the maximum length of freight trains at one-half mile, a clearance law, a law providing that all freight trains shall be equipped with standard two-truck cabooses, an election franchise law providing that railway men may vote while away from home, a semi-monthly pay law and a law to prohibit the operations of "loan sharks." Among the national laws to be urged are more restrictive immigration laws and national legislation to strengthen the proposed state laws wherever practicable. Mr. Lee also says that further efforts will be made to secure the enactment of full crew laws.

W. L. Chambers and G. W. W. Hanger, of the United States board of mediation and conciliation, went to St. Louis last week at the request of the St. Louis Southwestern to adjust the controversy growing out of the discharge of Conductor J. R. Tillman last May for intoxication. Announcement was made on Monday of this week that an agreement had been reached by which Conductor Tillman will withdraw all claims for reinstatement, and the officers of the road agree to take no disciplinary action toward employees who took part in the strike vote following the refusal of the road to reinstate Mr. Tillman. After the first strike vote the members of the Order of Railway Conductors were enjoined by a state court, at St. Louis, from striking, the court holding that the statement of facts in the case, on which statement the men were asked to vote, did not give a true view of the situation. A second strike vote has since been taken, and it has been reported that two-thirds of the men voted to strike.

Research Fellowships at University of Illinois

The engineering experiment station of the University of Illinois announces that four vacancies will be filled at the close of the current academic year in the research fellowships, ten of which have been maintained since 1907. These fellowships, each of which carries an annual stipend of $500, are open to graduates of approved universities and technical schools, appointment being made for two consecutive collegiate years. Not more than half the time of a research fellow is required for the work to which he is assigned, the remainder being available for graduate study, and at the end of the two years, if all requirements have been met, the master's degree is granted. The subjects covered in this research work include architecture, chemistry, civil engineering, electrical engineering, mechanical engineering, mining engineering, municipal and sanitary engineering, physics, railway engineering and theoretical and applied mechanics. Nominations to these fellowships are based on character, scholastic attainment and promise of success, preference being given to applicants who have had some practical engineering experience since completing their undergraduate work. Applications for nomination must be received by the Director, Engineering Experiment Station, University of Illinois, Urbana, Ill., not later than February 1.

Railroad Money Cures Paralysis

The Yazoo (Miss.) Sentinel, which has been publishing a number of articles on fraudulent personal injury claims against railroads, in its issue of December 3 describes a case in which Earle D. Christian sued the Yazoo & Mississippi Valley in the circuit court of Bolivar county, Mississippi, in May, 1909. He secured a verdict against the railroad company for $25,000 as damages for an injury in which he claimed to have been totally and permanently paralyzed from the waist line down; but after collecting the money he speedily recovered. The article states that there was but one eye witness to the accident, Christian's family physician, "who proved to be his star witness both on the cause of the accident and the extent of the injury." At the trial Christian was carried into court in the arms of two men who placed him in a wheel chair; and he appeared to be in a hopeless and helpless condition. After collecting his damages, however, "he entered upon the road to complete recovery within a short time. In a few months after the trial he was getting about on crutches. A little later on he paid a visit to Hot Springs and took a course of baths, and after that was able to walk about without his crutches. In December, 1913, when the temperature was freezing, he swam across a river, a distance of about 300 ft., on a bet, and won it. The performance was witnessed by a large number of people."

Mail Service in 1914

The second assistant postmaster general, in his annual report, says that in the fiscal year ending June 30, 1914, a total of 69,673 tons, or 4,963 carloads, of periodical mail matter was carried on fast freight trains, the cost for which was $706,154, whereas had the old practice of carrying such mail matter in regular mail trains been pursued the cost to the government would have been $2,133,586. During the fiscal year $4,627,200 was paid for railway post office car service. The appropriation for the next

fiscal year (ending June 30 next) is placed at $5,412,000, and for 1916 at $4,760,000.

The weight of paid-by-the-pound rate second-class mail received from publishers during the fiscal year was 513,450 tons, an increase of 14,677 tons, or 2.94 per cent over the previous year.

The total expenditure of the government for the transportation of mail by the railways in the last fiscal year was $50,853,360. The department's estimate for the year beginning next June is $58,229,000, being only 3.63 per cent more than the appropriation for the current fiscal year.

Summary of Revenues and Expenses of Large Steam Roads in October

The following figures were compiled by the Interstate Commerce Commission from monthly reports of operating revenues and expenses of large steam roads for the month of October, 1914. No reports are included for roads whose operating revenues for the year ended June 30, 1914, did not reach $1,000,000.

Report on Kansas City Southern Derailment Near Air Line Junction, Mo.

The Interstate Commerce Commission has just issued the report of H. W. Belnap, chief of the division of safety, on the investigation of a derailment on the Kansas City Southern near Air Line Junction, Mo., on October 19, 1914. A passenger train on a branch line extending from Kansas City to Independence, Mo., was derailed, resulting in the death of the engineman and the injury of the fireman.

The accident occurred about 100 ft. beyond the beginning of a 5 deg. 16 min. curve on a 1 per cent ascending grade. The testimony of the train employees showed that the speed was not high, probably not over 15 miles an hour; but an examination of the track showed very bad conditions, and the derailment was due to this defective track. In some places the gage varied from 4 ft. 8 in. at the joints, to 4 ft. 9¼ in. at the centers of the rails. The report says that within a distance of a half mile on each side of the point of accident about 50 joints were found with only one or two bolts in them, owing to the fact that the ends of some of the rails had no bolt holes drilled in them, while others were so badly matched with the angle bars that it was

FOR THE MONTH OF OCTOBER

Item	United States			Eastern District			Southern District			Western District		
	Amount	Per mile of road operated		Amount	Per mile of road operated		Amount	Per mile of road operated		Amount	Per mile of road operated	
	1914	1914	1913	1914	1914	1913	1914	1914	1913	1914	1914	1913
Average number of miles operated	228,252.70	...	...	58,667.61	...	...	42,286.18	...	...	127,278.91	...	...
Revenues:												
Freight	$189,014,588	$828	$931	$80,413,457	$1,371	$1,535	$26,521,802	$627	$768	$82,079,329	$644	$703
Passenger	53,809,333	236	268	23,298,172	397	433	7,134,588	169	201	23,376,573	184	214
Mail	4,936,500	22	20	1,732,064	30	30	627,767	15	15	2,576,669	20	17
Express	5,954,031	26	31	2,693,062	46	55	828,826	20	22	2,432,143	19	23
All other transportation	7,629,337	33	36	4,232,401	72	75	642,180	15	18	2,754,756	22	24
Incidental	5,236,615	23	25	2,715,752	46	47	621,400	14	17	1,899,463	15	16
Joint Facility—Cr.	332,150	1	1	145,531	2	2	58,383	1	1	128,236	1	1
Joint Facility—Dr.	*118,690*	...	...	*74,429*	*1*	*1*	*16,242*	...	...	*28,019*	...	...
Railway operating revenues	$266,793,864	$1,169	*$1,314	$115,156,010	$1,963	†$2,184	$36,418,704	$861	$1,042	$115,219,150	$905	$998
Expenses:												
Maint. of way and structures	$33,506,868	$147	$169	$13,930,976	$238	$291	$5,009,623	$118	$133	$14,566,269	$115	$123
Maintenance of equipment	43,977,419	193	219	20,372,232	347	411	7,320,232	173	191	16,284,954	128	139
Traffic	4,981,448	22	25	1,895,340	32	40	943,894	22	23	2,142,214	17	19
Transportation	89,519,294	392	442	41,580.832	709	801	12,518,579	296	336	35,419,883	278	310
Miscellaneous operations	1,949,867	8	11	896,763	15	21	195,222	5	5	857,882	7	8
General	6,180,109	27	27	2,609,601	45	43	1,003,431	24	24	2,567,077	20	21
Transportat'n for Investm't—Cr.	*683,596*	*3*	*2*	*67,004*	*1*	...	*138,726*	*3*	*1*	*477,866*	*4*	*3*
Railway operating expenses	$179,431,409	$786	$891	$81,218,740	$1,385	$1,607	$26,852,256	$635	$711	$71,360,413	$561	$617
Net revenue from railway operations	$87,362,455	$383	$423	$33,937,270	$578	$577	$9,566,448	$226	$331	$43,858,737	$344	$381
Railway tax accruals	$11,522,028	$51	$51	$4,735,433	$81	$84	$1,550,558	$37	$37	$5,236,037	$41	$41
Uncollectible railway revenues	61,791	...	...	23,447	...	...	6,886	...	...	31,458	...	...
Railway operating income	$75,776,636	$332	$372	$29,178,390	$497	$493	$8,009,004	$189	$294	$38,591,242	$303	$340

FOR THE FOUR MONTHS ENDING WITH OCTOBER

	1914	1914	1913	1914	1914	1913	1914	1914	1913	1914	1914	1913
Average number of miles operated	227,968.91	...	...	58,670.36	...	...	42,260.15	...	...	127,038.40	...	...
Revenues:												
Freight	$719,675,244	$3,157	$3,374	$312,436,068	$5,325	$5,752	$104,641,293	$2,746	$2,668	$302,597,883	$2,382	$2,496
Passenger	245,452,997	1,077	1,181	109,449,871	1,866	2,012	32,110,904	760	832	103,892,222	818	909
Mail	19,036,125	83	79	6,931.716	118	115	2,508,921	59	58	9,595,488	75	68
Express	23,188,990	102	114	10,367,061	177	202	3,379,622	80	82	9,442,307	74	83
All other transportation	30,311,245	133	139	16,978,329	289	292	2,384.609	56	62	10,948,307	86	93
Incidental	21,095,936	92	98	11,038,960	188	193	2,352,356	56	62	7,704,620	61	66
Joint Facility—Cr.	1,256,188	6	5	566,762	10	9	239,058	6	6	450,368	4	4
Joint Facility—Dr.	*437,854*	*2*	*2*	*285,293*	*5*	*4*	*53,167*	*1*	*1*	*99,394*	*1*	*1*
Railway operating revenues	$1,059,578,871	$4,648	‡4,995	$467,483,474	$7,968	§$8,598	$147,563,596	$3,492	$3,769	$444,531,801	$3,499	$3,718
Expenses:												
Maint. of way and structures	$138,352,057	$607	$689	$57,134,132	$974	$1,169	$21,480,285	$508	$531	$59,737,640	$470	$517
Maintenance of equipment	175,943,125	772	828	81,105,130	1,382	1,527	29,741,836	704	717	65,096,159	512	537
Traffic	19,777.574	87	97	7,454,873	127	151	3,757,630	89	87	8,565,071	67	74
Transportation	351,377,179	1,541	1,674	163,513,734	2,787	3,068	50,602,625	1,197	1,272	137,260,820	1,081	1,156
Miscellaneous operations	8,231.613	36	45	3,843,507	66	86	734,386	17	19	3,653,720	29	35
General	24,331,381	107	108	10,251,274	175	174	3,962,255	94	94	10,117,852	80	82
Transportat'n for Investm't—Cr.	*2,444,897*	*11*	*6*	*211,557*	*4*	...	*439,507*	*10*	*1*	*1,793,833*	*14*	*10*
Railway operating expenses	$715,568,032	$3,139	$3,435	$323,091,093	$5,507	$6,175	$109,839,510	$2,599	$2,719	$282,637,429	$2,225	$2,391
Net revenue from railway operations	$344,010,839	$1,509	$1,560	$144,392,381	$2,461	$2,423	$37,724,086	$893	$1,050	$161,894,372	$1,274	$1,327
Railway tax accruals	$45,635,916	$200	$198	$18,742,117	$319	$317	$6,254,141	$148	$145	$20,639,658	$162	$160
Uncollectible railway revenues	166,963	1	...	63,063	1	...	24,669	1	...	79,231	1	...
Railway operating income	$298,207,960	$1,308	$1,362	$125,587,201	$2,141	$2,106	$31,445,276	$744	$905	$141,175,483	$1,111	$1,167

* Includes $2 unclassified. † Includes $8 unclassified. ‡ Includes $7 unclassified. § Includes $27 unclassified.

impossible to insert bolts. The ties were also in very poor condition. The immediate cause of the accident was the spreading and turning over of three rails on the inside of the curve.

The report contains a half dozen half tone engravings showing track, near the point of derailment, evidently unfit for any speed, but the very lowest; and the inspector concludes that "in this accident the question of speed is not involved, there being no doubt that the track conditions existing in the vicinity of this derailment were such that trains could not be operated with safety even at low speed."

Postal Surplus Result of Unfair Railway Mail Pay

"Had payments to the railroads for hauling the mails increased only half as fast in the past two years as did the volume of mail carried, the $3,569,545 surplus just reported by Postmaster General Burleson in his annual report for the last fiscal year would have vanished," says the Bureau of Railway News and Statistics in a bulletin. "To test the postmaster's jubilant announcement that 'for the first time since Benjamin Franklin organized the postal service the post office department has been securely placed on a self-sustaining basis,' the bureau has analyzed the post office reports of the last three years. So-called surpluses for 1913 and 1914 are shown to be wholly the product of phenomenal growth in mail under the new parcel post, accompanied by almost total failure to pay the greater expense of transportation, subjecting the railways to extortion through forcing on them enlarged business at unfair rates. The contrast follows:

	1914.	1913.	1912.
P. O. revenue	$287,934,565	$266,619,526	$246,744,016
Increase over 1912	16.7 per cent	8.0 per cent	.....
P. O. expense	283,558,102	262,108,875	248,529,539
Increase over 1912	14.1 per cent	5.4 per cent	.....
Excess revenue	$4,376,463	$4,510,651	*$1,785,523
Surplus	3,569,545	3,841,907	.....
Railway mail pay	53,000,000	51,959,387	51,691,301
Inc. over 1912	2.5 per cent	0.5 per cent	.....

*Deficit.

"Against a 16.7 per cent two-year gain in business, pay to the railways for service which must have expanded in like proportion was enlarged but 2.5 per cent. With quadrennial weighings roads whose mail tonnage was weighed in 1912 must wait till 1916 to enjoy added revenue from the fast mounting tonnage. By similar repudiation of vital expenses even the most tottering enterprise might of course be put on paying basis."

Mail Pay Discussions in Congress

Ralph Peters, Chairman of the Committee on Railway Mail Pay, representing 264 leading railroads, operating nearly 90 per cent of the total railroad mileage of the United States, has issued a statement calling attention to the fact that the House of Representatives has adopted a special rule declaring in order the railway-mail-pay rider in the post office appropriation bill. "The true purpose of this bill, as revealed in debate," says Mr. Peters, "is to reduce railway mail pay by many millions a year. . . ." Chairman Moon openly advanced this proposal despite the injustice manifest on its face. . . . The Bourne Committee found that the railroads were entitled to an advance of at least $3,000,000 a year for carrying the mails, with relief from certain incidental services now rendered without payment. Chairman Moon's committee recommended to the House an increase of more than $2,000,000 in next year's appropriation for railway mail pay, but this apparent promise of the bill and its real object are vastly different things. Chairman Moon, on December 19, said before the House: 'It does not show a saving upon its face . . . but you have changed from the quadrennial weighing of the mails on a weight basis, on which the pay is to be computed, to the space provision, and *you will have enough space under the contract to carry all your parcel post probably without any additional compensation and save many millions annually.* . . .' Again Chairman Moon said, more specifically: 'Does not the gentleman know that the main feature of this bill, the only great feature in it, is the railroad pay proposition, and does he not know that when he voted as he did he voted against the consideration of that railroad proposition, that would save this country eight millions of dollars every year, if carried?'

"So the chairman of the House Committee which recommended an increase of $2,000,000 in the appropriation to pay the railroads for carrying the mails, stated on the floor of the House that the bill would save the government $8,000,000 annually.

"The railway mail pay rider in the post office appropriation bill was not conceived in the 'spirit of candor and justice,' which President Wilson has set forth as the proper spirit. It is a bald attempt to create a specious show of economy in the operations of one department of the government by depriving the railroads of a large part of the compensation they fully and fairly earn in the performance of an indispensable public service."

Arbitration of Enginemen's Demands

The hearing before the board of arbitration at Chicago on the demands of the engineers, firemen and hostlers of the western roads for increases in pay and changes in working conditions, was taken up last week with the testimony of a large number of engineers and firemen who went into details regarding the conditions of their work and described experiences to show the hardships which some of them encounter, and the long hours which some of them work, together with statements to show their increased cost of living. One of the principal items in the latter mentioned was the increased cost of meals and lodging when they are away from home.

Most of the witnesses dwelt on the increased size and capacity of the locomotives and the increased length or weight of trains, which they said has increased their labor and responsibility, and also the "productive efficiency" of their work. A large number of the witnesses described the dangers, hardships or difficulties of running through tunnels or over heavy grades in the western mountains, the difficult weather conditions encountered in the Northwest, especially in Canada, and the dangers of working on electric locomotives. An engineman who runs through the Cascade tunnel told of four men being injured from burns while operating electric locomotives. Several witnesses described surprise tests in which they said the signals had been changed to indicate stop when they were so near that it was impossible to stop the train in time; and in one case both engineman and fireman, fearing derailment or collision, had jumped and were injured. A Canadian Pacific engineman said he had frequently encountered temperatures of 45 or 50 deg. below zero, and he described a snow slide which overturned his engine and killed six people. Some complaint was made also of unfair disciplinary measures by officials. Warren S. Stone, grand chief of the Brotherhood of Locomotive Engineers, complained of blacklisting methods, saying that he could offer evidence that when an employee loses his position on one road and goes to another his previous record is "flashed upon him in the most minute detail."

The firemen said their chances of promotion had been greatly decreased in recent years, partly by reductions in force, due to the falling off of business at various times, and partly because of the introduction of larger engines which reduced the number of men required, and which had caused a number of enginemen who had been promoted from firemen to be set back to firing again. Others gave figures showing the large amount of coal shoveled. An engineman employed on the Minneapolis, St. Paul & Sault Ste. Marie told of a case where a division terminal of the road was changed, which required the employees to move their homes and, he said, compelled a large number of the men to lose money by selling their houses at forced sale. A number of men spoke of averaging 14 to 15 hours a day at work, which gave them practically no time at home with their families; but they said that they were able to "lay off" for several days during the month.

The board on Tuesday adjourned to January 4.

Second National Foreign Trade Convention

The second National Foreign Trade Convention will be held at St. Louis, Mo., on January 21 and 22, 1915. Three thousand commercial and industrial organizations, corporations, firms and individuals engaged in foreign trade, have been invited to send delegates. The meeting will be opened by the Hon. W. C. Redfield, secretary of commerce, and among the papers will be one by John Bassett Moore, formerly counselor of the state department and the leading American authority on international law, the subject of the paper being "Problems Arising in War and Commerce."

The Traffic Club of New York

At the regular monthly meeting of the Traffic Club of New York at the Hotel Astor, New York, on December 29, August Thomas will address the club on current events. It is also announced that a concert will be rendered by the orchestra of the American Express Employees' Association. The annual dinner of the club will be held at the Hotel Astor on Saturday evening, February 13.

MEETINGS AND CONVENTIONS

The following list gives the names of secretaries, dates of next or regular meetings, and places of meeting of those associations which will meet during the next three months. Hereafter the full list of meetings and conventions will be published only in the first issue of the Railway Age Gazette for each month.

American Society of Civil Engineers.—Chas. W. Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except June, July and August, 220 W. 57th St., New York.

American Society of Engineering Contractors.—J. R. Wemlinger, 11 Broadway, New York. Regular meetings, 2d Thursday in month, at 2 P. M., 11 Broadway, New York.

American Wood Preservers' Association.—F. J. Angier, B. & O., Mt. Royal Sta., Baltimore, Md. Next convention, January 19-21, 1915, Chicago.

Association of Transportation and Car Accounting Officers.—G. P. Conard, 75 Church St., New York.

Canadian Railway Club.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

Canadian Society of Civil Engineers.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 Lawler Ave., Chicago. Regular meetings, 2d Monday in month, except July and August, Lytton Bldg., Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meetings, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

Engineers' Society of Western Pennsylvania.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh.

General Superintendents' Association of Chicago.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.

New England Railroad Club.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2d Tuesday in month, except June, July, August and September, Boston.

New York Railroad Club.—Harry D. Vought, 95 Liberty St., New York. Regular meetings, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

Niagara Frontier Car Men's Association.—E. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings monthly.

Peoria Association of Railroad Officers.—M. W. Rotchford, Union Station, Peoria, Ill. Regular meetings, 2d Thursday in month, Jefferson Hotel, Peoria.

Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Friday in month, Kansas City.

Railway Business Association.—Frank W. Noxon, 30 Church St., New York.

Railway Club of Pittsburgh.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.

Richmond Railroad Club.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

Salt Lake Transportation Club.—R. E. Rowland, Hotel Utah Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. P. R. R., Atlanta, Ga. Next regular meeting, January 21, 1915, Atlanta, Ga.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Candler Bldg., Atlanta.

Toledo Transportation Club.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

Traffic Club of Chicago.—W. H. Wharton, La Salle Hotel, Chicago.

Traffic Club of Newark.—John J. Kautzmann, P. O. Box 238, Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, Newark.

Traffic Club of New York.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month except June, July and August, Waldorf-Astoria, New York.

Traffic Club of Pittsburgh.—D. L. Wells, Erie R. R., Pittsburgh, Pa. Meetings bimonthly, Pittsburgh. Annual meeting, 2d Monday in June.

Traffic Club of St. Louis.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

Transportation Club of Detroit.—W. R. Hurley, Superintendent's office, L. S. & M. S., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.

Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Karpen Bldg., Chicago.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings.

Traffic News

E. N. Hurley, president of the Illinois Manufacturers' Association, addressed the Traffic Club of Chicago on Friday, December 18, on "Opportunities for South American Trade."

Passenger traffic officers of roads in Ohio and Indiana have this week held a conference with the Ohio Public Utilities Commission concerning their desire to have action taken looking to the repeal of state two-cent fare laws; and on another day they held a similar conference with the governor of Indiana.

The Mississippi Electric Navigation Company of St. Louis, has announced its intention of letting contracts for steel freight barges to be ready for service on May 1. They are to be operated between St. Louis and upper and lower Mississippi river points. It is said the boats will have a capacity of 1,000 tons each.

Suburban passenger fares to and from Baltimore, which were raised at the same time as those at Philadelphia, heretofore noticed, have also been the subject of litigation, an injunction having been issued by the Baltimore county court. This injunction, it is said, will have the effect of continuing the former rates in force until the Public Service Commission shall have made a report on the new tariffs, or until the railroad company can secure the removal of the injunction.

The Pennsylvania Railroad, beginning January 1, will resume the issuance of permits granting reduced passenger rates to clergymen; but not in the state of Pennsylvania, where the constitution and laws forbid reductions in passenger fares, except to employees of the railroad. The Public Service Commission of the state in March last ruled that the clause of the Public Service Company law, 1913, forbidding discrimination by carriers between persons, forbade making a discount to clergymen.

It is reported that since the passenger fare from Chicago to St. Louis was increased from $5.80 to $7.50 on December 15, a large number of passengers have been buying tickets from Chicago to East St. Louis, Ill., or Granite City in order to take advantage of the two-cents a mile intrastate fare in Illinois, and then paying separate fares across the Mississippi river to St. Louis—10 cents by trolley across the bridge or 25 cents on the steam passenger trains. As the fare from Chicago to East St. Louis is $5.62 this makes a considerable saving.

The spokesman of the suburban passengers aggrieved by the recent decision of the Pennsylvania Public Service Commission, allowing an increase in the prices of certain suburban tickets, has filed charges with the governor of the state calling on him to remove the members of the commission because of their "inefficiency, neglect of duty and misconduct in office." The commissioners named in the complaint are former Gov. Samuel Pennypacker, Emory Johnson, Milton Brecht, S. Larue Tone, Charles Wright and Frank Wallace. Mr. Pennypacker's comment, as reported, was, "Let 'em file 'em and be hanged."

On November 17, in accordance with a notice issued on August 15, the Panama Railroad Company ceased to act as a co-carrier in connection with steamship lines running to and from the isthmus. In order, however, to take care of through freight coming to the isthmus in vessels that do not use the canal, the Panama Railroad Steamship Line has established a fortnightly service between New York and Balboa, which is expected to take care of all freight of this nature arriving at Balboa northbound, or at Cristobal southbound. In case the volume of business warrants, other vessels of the Panama Railroad Steamship Line will be put in service.

L. J. Spence, director of traffic of the Southern Pacific, has issued a statement saying that if President Wilson desires to afford the railroads an immediate measure of relief it is within his power to send a recommendation to Congress to repeal that provision in the law which empowers the commission to suspend advanced rates before they come effective. "Under existing practice," he says, "the railroads are considered guilty of extortion until they prove their innocence, and may suffer starva-

tion while awaiting the sustenance to which they are eventually found to be entitled. My suggestion affords adequate protection to all interests."

The attorney-general of New York, who is investigating the egg trade in New York City, has brought out additional information concerning the frauds perpetrated on the trunk line railroads during the past three or four years in connection with claims for eggs broken in transportation. Out of thirteen inspectors formerly employed by trunk line roads, it is said that ten had accepted bribes from egg dealers, to approve unfounded claims for damages. The bribes are said to have run from $25, for a single report, to a regular salary of $85 a week for approving claims. The man who had investigated the records testified that in one week the receipts of eggs at seven stations in New York amounted in value to $28,650, while the claims for damages on the same shipments amounted to $21,687.

Checking Baggage on "Split Tickets"

Among the new tariff announcements issued last week by the New York State Public Service Commission, second district, were abstracts of notices from certain roads relative to changes in baggage regulations. A sample notice says:

In checking on composite transportation no tickets or ticket orders issued by foreign lines will be honored as forming a part of through transportation for the checking of baggage, the sale of parlor car or sleeping car tickets, or the making of reservation in parlor cars or sleeping cars, to points beyond Buffalo, Niagara Falls, Suspension Bridge, Lewiston, Salamanca, or Dunkirk. Effective January 15.

Another road announces a new regulation providing that through checks will be issued on presentation of tickets, mileage books, or passes provided they form complete and valid transportation from starting point to destination; but checks will not be issued on such combined transportation when a wagon transfer is necessary at a junction point on which transportation is split, unless the passenger purchases a transfer tag for each piece of baggage checked.

GERMAN EXPLOSIVE TRAINS BLOWN TO PIECES.—An English contemporary states that news has been received in Petrograd of a terrible collision between two German military trains loaded with pyroxilin and shells in the government of Kielce. Both trains were utterly destroyed and not a soul of those in charge of them survived. The explosion was so terrific that it was heard for a distance of over 30 miles.

FRENCH RAILWAYS RESTORED BY GERMANS.—It is reported from Amsterdam that the Germans have restored the railways from Charleville, in the Department of the Ardennes, to Rheims, and from Hirson, in the Department of the Aisne, to Montmedy, in the Department of the Meuse, twenty-five miles north of Verdun. These railways were destroyed by the French in their retreat before the first German advance on Paris. It is also stated that the railways at Givet, on the Belgian border, will be opened soon; that the bridges over the Meuse near Lumes, Flize and Donchery, to the southeast of Mezieres, are ready for service again and the blocked tunnels near Montmedy and Mohon (just south of Mezieres) have been opened.

AERIAL RAILWAYS IN SWITZERLAND.—It is generally admitted that mountain railways of the aerial cable type cost less to construct than the funicular, and in Switzerland there are several under construction. L'Electricien of Paris describes a new ropeway recently constructed near Bozen, where there is a rise of 2,750 ft. in 5,400 ft., and an average inclination of 43 deg. The two cars, one of which ascends while the other descends, are connected by a cable in duplicate. The up and down lines are 20 ft. apart, and each consists of two steel cables 20 in. apart, on which runs a four-wheel trolley, to which the car is attached. The double cables which draw the cars are operated by an electric motor fixed at the highest station. The supply of current, which is taken from a central station, is supplemented by a battery for emergency use. Hand gear on the car is also provided. All cables are in duplicate, and a large factor of safety has been allowed. The ropeway is supported on steel lattice towers, 56 ft. being the maximum height, and the longest span 1,300 ft. The cars take eight passengers inside and eight outside.—*The Engineer.*

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Rates on Cotton to Mobile

Mobile Chamber of Commerce et al. v. Mobile & Ohio et al. Opinion by Commissioner McChord:

The commission finds that the rates on export cotton from all points in the southeast on the lines of defendants to Mobile are reasonable, but it is held that certain practices of the carriers serving that city should be corrected. A system of rates referred to as "penalty rates" is condemned, the idea of the rates being that a rate higher than a normal local is exacted for the movement from the point of origin to the compress point and, if the shipment then moves to a port of the line of the originating carrier, such higher rate so assessed is applied on the through rate from point of origin to the port. This, in addition to the refusal of the Atlantic Coast Line, Central of Georgia and the Seaboard Air Line to join in through routes or joint rates from certain points to Mobile is held to be discriminatory to that city. Certain rates are found prejudicial to Mobile as compared with Savannah, and defendants are required to readjust them.

At the present time several of the carriers refuse to grant through bills of lading except in the case of shipments which will move via certain docks in which they have a special interest. It is found that these through export rates should also apply on shipments going to other docks. It is proposed that the carriers establish a uniform terminal charge of 3 cents per 100 lb., which shall apply under a system of universal switching so that any of the docks located at Mobile shall be available to shippers located on any of the lines serving Mobile. This charge of three cents is understood to be for an additional service to that rendered at the present time. The export cotton rates to Mobile should be quoted as for station delivery or for delivery at point of interchange at Mobile and the terminal charge for ship-side delivery should be stated as an additional charge; but nothing herein is to be taken as authorizing an increase in the present through rates to ship side.

The commission states that the "through bill of lading" issued on export cotton shipments, entails no responsibility on the part of the rail carrier as a common carrier after it delivers the shipment at the dock or after it is delivered to the connecting carrier at its interchange track in Mobile. The agent of the carrier at the point of origin should, therefore, issue through bills of lading when the shipper simply designates the wharf or dock in Mobile at which he wishes delivery made.

"City cotton" when delivered to a carrier at its station proper in Mobile, or at its interchange track, is to be delivered to the dock or wharf served by it at the uniform terminal charge, and should be subject to the same provisions as to free time and demurrage as other export cotton.

Cotton shipped into Mobile as local, when later declared to be export, must take the export cotton rate to Mobile proper plus the terminal charge. (32 I. C. C., 272.)

Rates from Houston to Points in Louisiana

Chamber of Commerce, Houston, Tex., v. International & Great Northern et al. Opinion by Commissioner Daniels:

The commission finds that it is not unreasonable or discriminatory that carriers should apply a rate scale of $1.37 from Houston, Tex., to points in Louisiana. The rate of 80 cents from Houston to New Orleans is necessitated by water competition and should not be established on traffic upon which water competition does not apply. It is held, however, that certain combination rates, via the gateways, Shreveport, Alexandria, Baton Rogue, Crowley, Oakdale and Napoleonville which may be lower than $1.37 should be published as through rates so that shippers may know that they exist and be put in a condition to make use of them.

Carriers, in the tariffs in issue, proposed to restore to $1.37 the rates from Houston, Tex., to all points on the Vicksburg, Shreveport & Pacific, a rate of 80 cents having been published

in error. The commission finds that there was no reason why the rates to these points should not equal the combination of locals with $1.37 as a maximum and that the carriers are justified in permitting the 80-cent scale to be applicable from Houston to Vicksburg only on traffic consigned to southeastern points.

The commission also finds that the carriers are not justified in making increases on the first and second class rates between Houston and points on Morgan's Louisiana & Texas from Alexandria to Torian.

It is also held that the carriers have not justified an increase from a 60 cent scale to an 80 cent scale in the rates from Houston to stations on the main line of the Louisiana & Western from Maignaud to Rupert, and from points on its branch including Morse, Gueydan, Kaplan, Lastie and intermediate points; a scale of 70 cents is prescribed.

The commission also finds that the carriers have not justified increases in the rates on soap and washing compounds from Houston to New Orleans, and group 4 points from 29 cents to 30 cents. On the other hand an increase in rates on the same products from Houston to Lake Charles and West Lake from 15 cents to 26 cents is allowed. An increase in the rates on scrap iron in carloads from New Orleans and New Iberia to Houston, from $2.50 per ton of 2,000 lb. to 16 cents per 100 lb., is likewise found to be not justified, and it is ordered that the rate be not in excess of 16 cents. (32 I. C. C., 247.)

STATE COMMISSIONS

See Oklahoma decision in Court News.

At a hearing before the Massachusetts Public Service Commission in Boston, December 17, numerous remonstrances were presented against the proposed increases in passenger rates which have been filed by the Boston & Maine. The commission called upon the road to present, from its financial records, the evidence relied on to prove that an increase in rates is necessary.

The Pennsylvania Public Service Commission announces that at Harrisburg, January 8, it will give a rehearing on the advances in Philadelphia suburban passenger rates which were the subject of a decision issued last week. Representatives of the passengers who made the original complaint declare that they are not satisfied with the decision of the commission, which allowed an increase of about 50 per cent in the rate on one hundred-ride tickets good for six months.

At Richmond, December 17, the Virginia state corporation commission imposed a fine of $1,000 on the General Railway Signal Company, Rochester, N. Y., as a penalty for doing business in Virginia without having obtained a certificate of authority from the commission. The signal company will appeal to the courts. The complaint before the commission is based on work done for the Southern Railway, in the construction of automatic block signals, on 147 miles of road, for a total consideration of $214,040.

The railroad commission of Louisiana has authorized the Vicksburg, Shreveport & Pacific to discontinue passenger trains No. 5 and No. 6. These are way trains running the whole length of the road, 172 miles, and the report of the commission, explaining at length the reasons for its action, says that the trains were put on in November, 1912, as an experiment. Receipts are now low on all passenger trains. With these trains off there will be two trains each way, daily, throughout the length of the road, and one additional each way between Monroe and Shreveport, 96 miles.

F. G. Jonah, chief engineer of the St. Louis & San Francisco, was the principal witness at a hearing before the Missouri Public Service Commission on December 15, on the application of the Missouri roads for general increases in freight and passenger rates in the state. Mr. Jonah testified that it would cost $68,527 a mile to reproduce the 1,773 miles of track of the St. Louis & San Francisco in Missouri, including equipment and terminals. He estimates that the value of the terminal facilities of the Frisco in Kansas City alone is $15,000,000. As an example of the heavy increase in railroad expenses, he cited the cost of eliminating grade crossings. Recently $80,000 was spent by his road in Kansas City for that purpose, and $220,000 in St. Louis, and the road may have to expend $300,000 more in St. Louis. Alexander Hilton, passenger traffic manager of the St. Louis & San Francisco, testified before the commission on December 16. He described the reduction in earnings on passenger business resulting from the enforcement of the two-cent fare law in Missouri, which he said was general to all of the roads, and said that the two-cent rate had not had the effect of stimulating traffic, and that if it is to be continued there must be further and radical reductions in passenger train service. He said that while the Frisco's passenger mileage had increased during 1914, its revenues had decreased $98,000. A. L. Conrad, assistant general auditor of the Atchison, Topeka & Santa Fe, told the commission that over 19 per cent of the total number of passengers carried by the Santa Fe in Missouri for a period of five months, including, July, August, September, October and December, 1913, paid no fares. He said this was due largely to the fact that during the months in question the employees of the roads were taking their vacations.

Discrimination to Please the State

The Massachusetts Public Service Commission has issued a report holding that the Boston & Maine's freight rates to and from the pier of the National Dock & Storage Warehouse Company in East Boston, are discriminatory, as compared with the rates to and from the Commonwealth dock in South Boston. But the situation is so complicated that the parties directly interested in it are called upon to get together and try to make a readjustment that shall not unduly disturb business conditions. Ninety days are given within which to make such readjustment.

The discriminatory rates came into existence by reason of the state's development of the pier property in South Boston and the agreement obtained by the Port Directors from the New York, New Haven & Hartford that it should not make any switching charge on goods passing through the Commonwealth Pier. Thus the state obtained special privileges for those who used the Commonwealth dock, not granted to those using the private docks in East Boston. Interstate Commerce Commission reports and court decisions are quoted in support of the contention that unjustly discriminatory rates cannot be maintained, even for the purpose of developing public property.

"The attitude of the Directors of the Port in this matter," says the report, "is clear, but they had no jurisdiction or authority to force the railroad companies to absorb the switching charges from piers in the harbor. It is, however, within the power of the railroad companies to do so, and it would seem that those companies having voluntarily executed this contract with the Port Directors, must take such steps as are necessary to carry out the contract in accordance with the law, and are bound, so long as this contract remains in force, to apply similar rates for similar service to other piers on the water front."

PERSONNEL OF COMMISSIONS

William H. Fisher, of Brownsville, Pa., has been appointed an inspector for the Pennsylvania Public Service Commission.

COURT NEWS

The Supreme Court of the United States has decided in favor of the Erie Railroad in a suit against the Berwind-White Coal Company for demurrage on cars of coal which had been stopped en route to await reconsignment orders.

The Missouri Pacific on December 18, applied to the Supreme Court of Nebraska for a writ of mandamus to compel the state railway commission to accept its application made some time ago for a hearing on a proposed advance in the passenger fares throughout the state from 2 cents to 3 cents a mile. The commission declined to grant the hearing requested on the ground that it has no jurisdiction to change the passenger fares, which are fixed by law.

In a decision rendered by the Supreme Court of Oklahoma, granting to the Atchison, Topeka & Santa Fe a writ of prohibition against an order of the state corporation commission, ordering the Santa Fe to build a viaduct across a street in Guthrie, Justice Riddle differentiates between the power of the commission to order viaducts constructed for the safety of passengers or freight, and the power of the commission to order viaducts constructed as a preventive of accidents to pedestrians. Where the safety of pedestrians alone is involved only the municipal authorities can compel the construction of viaducts or grade crossings, says the opinion.

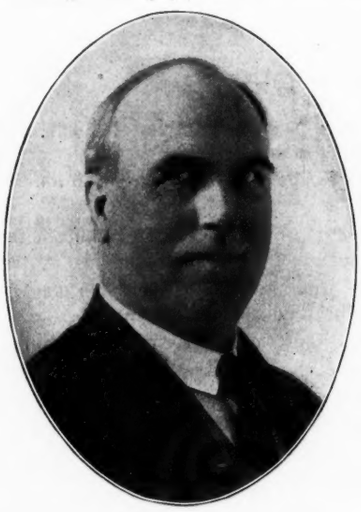
Railway Officers

Executive, Financial, Legal and Accounting

Francis T. A. Junkin, general attorney of the Atchison, Topeka & Santa Fe system, has resigned.

T. F. Darden, special accountant of the Atlantic Coast Line at Wilmington, N. C., has been appointed assistant to the president.

Robert Dunlap, general attorney of the Atchison, Topeka & Santa Fe system at Chicago, has been appointed western solicitor, with headquarters at Chicago, effective January 1. He will have special charge of corporate and contract matters, and of litigation outside of the states through which the lines of the system run, give counsel to state solicitors in matters arising in their respective jurisdictions, continue to act as solicitor for Illinois, and perform such other duties as may be assigned to him. Mr. Dunlap was born October 4, 1853, at Cincinnati, Ohio, and was educated at the Cincinnati University. He began railway work in 1883 as assistant attorney for the Atchison, Topeka & Santa Fe, with which road he has remained ever since. In 1895 he was appointed assistant to the general solicitor for the receivers, and in 1897, upon the reorganization of the company, he was made general attorney at Chicago, from which position he will be promoted on January 1 to western solicitor, as above noted.



R. Dunlap

S. T. Bledsoe, general attorney of the Atchison, Topeka & Santa Fe at Oklahoma City, Okla., has been appointed assistant general solicitor, with headquarters at Chicago, effective on January 1. In addition to his general duties he will have special charge of valuation and tax matters, supervision of proceedings before state commissions and of litigation resulting from their orders and from legislative acts, and perform such other duties as may be assigned to him. Mr. Bledsoe was born May 12, 1868, in Clinton County, Kentucky. He was educated at the Southern Normal School and Business College at Bowling Green, Ky., and the University of Texas. He entered railway service in 1893 as local attorney for the Gulf, Colorado & Santa Fe at Ardmore, I. T., and in 1907 was appointed attorney for Indian Territory for the same road. From 1908 to July, 1912, Mr. Bledsoe was a member of the firm of Cottingham & Bledsoe, solicitors for Oklahoma for the Atchison, Topeka & Santa Fe. On the latter date he became general attorney for the Santa Fe at Oklahoma City, Okla., retaining his connection with the firm of Cottingham & Bledsoe. On January 1 he will become assistant general solicitor at Chicago, as above noted.

S. T. Bledsoe

Henry L. Waldo, solicitor of the Atchison, Topeka & Santa Fe for New Mexico at East Las Vegas, N. M., has resigned, effective December 31. W. C. Reid, assistant attorney at Roswell, N. M., succeeds Mr. Waldo as solicitor for New Mexico, with headquarters at Albuquerque, N. M. The headquarters of R. E. Twitchell, assistant solicitor for New Mexico, have been removed from East Las Vegas, N. M., to Santa Fe.

Operating

H. Wheeler, superintendent of the White Pass & Yukon, has been appointed general manager.

J. J. Cogan has been appointed general superintendent of the Florence & Cripple Creek and leased lines, also of the Midland Terminal Railway, with headquarters at Colorado Springs, Col. Effective January 1, 1915.

C. L. Brevoort, superintendent of the Cincinnati Terminal division of the Cincinnati, Hamilton & Dayton, has been granted leave of absence, and the position has been abolished. R. B. Mann, general agent at Toledo, Ohio, has been appointed assistant superintendent of the Toledo division at Cincinnati, Ohio, with jurisdiction over the territory from Cincinnati to New River. E. W. Hoffman has been appointed assistant superintendent of the Toledo division, with headquarters at Toledo, with jurisdiction over the district from Toledo to Bates. C. W. Havens, assistant trainmaster at Dayton, Ohio, has been appointed trainmaster, succeeding G. F. Reel, assigned to other duties.

Traffic

A. F. Zipf has been appointed traffic manager of the White Pass & Yukon, with headquarters at Seattle, Wash., succeeding J. E. Dempsey.

Eugene Duval, assistant general western agent of the Chicago, Milwaukee & St. Paul at Omaha, Neb., has been appointed general western agent at that place, succeeding F. A. Nash, deceased.

W. G. MacEdward, general passenger agent of the Detroit & Mackinac, has been appointed also general freight agent, with headquarters at Bay City, Mich., succeeding J. K. Hudson, resigned.

Engineering and Rolling Stock

C. E. Stone has been appointed general car foreman of the Missouri & North Arkansas, with headquarters at Harrison, Ark.

G. M. Lang has been appointed roadmaster of the Canadian Pacific, in charge of Coronation subdivision, with office at Coronation, Alta., in place of W. E. Lissiman.

H. H. Harsh, division engineer of the Baltimore & Ohio, at Cleveland, Ohio, has been transferred as division engineer to Garrett, Ind., succeeding F. D. Nauman, resigned.

Joseph Kowol has been appointed roadmaster of the Northern Pacific at Sedro Woolley, Wash. This name was incorrectly given as Joseph Korvol in our issue of December 18.

OBITUARY

James Wallace Cunningham, land and tax commissioner for the International & Great Northern, died on December 10 at his home in Houston, Tex., aged 54 years.

William Reed Hancock, formerly treasurer of the Wisconsin Central, died on December 16, at his home in Milwaukee, Wis., as a result of injuries received in an automobile accident about three weeks ago. He was born at Ashtabula, Ohio, on February 8, 1841, and began railway work in 1872 as treasurer of the Green Bay & Minnesota. He was subsequently cashier and accountant for the receiver of the same road; assistant treasurer and accountant of the Green Bay, Winona & St. Paul, and from January, 1887, to October, 1893, auditor of the Milwaukee, Lake Shore & Western. Mr. Hancock then went to the Wisconsin Central, of which road he was cashier and paymaster

until July, 1899, assistant treasurer from the latter date to November, 1900, and then treasurer until about four years ago.

Eugene Zimmerman, formerly president of the Cincinnati, Hamilton & Dayton, died suddenly in Cincinnati, Ohio, on December 20, of hemorrhage of the lungs. Mr. Zimmerman was born December 17, 1845, at Vicksburg, Miss. He attended school at Gambier and Farmers College, and was educated as a civil engineer. He began railway work in 1878 as assistant engineer on construction of the Cincinnati & Green River. In 1881 he was chief engineer of the Kentucky & South Atlantic; in 1883 he was president and chief engineer of the Chesapeake & Nashville, and in 1888 he became president of the Dayton, Fort Wayne & Chicago. Mr. Zimmerman was made vice-president of the Cincinnati, Hamilton & Dayton, in June, 1892 and became president of that road in July, 1904, which position he held until October, 1905. He was also chairman of the board of the Pere Marquette from May to October, 1905. He also was for a time president of the Detroit, Toledo & Ironton and the Ann Arbor. He has been president of the Dayton, Lebanon & Cincinnati for several years.

E. Zimmerman

Henry S. Hayward, consulting engineer of floating equipment of the Pennsylvania Railroad Lines East of Pittsburgh, Pa., with headquarters at Jersey City, N. J., whose death on December 14, at Augusta, Ga., was noted in these columns last week, was born on September 19, 1845, at Brooklyn, N. Y. He served a four-years' apprenticeship in marine construction work and engineering, and then to 1873, was in continuous sea service, first as junior engineer, and later was promoted until he became chief engineer on the steamships of the Pacific Mail Steamship Company. In April, 1873, he entered the service of the Pennsylvania Railroad as a machinist in the Altoona shops. The following year he was assigned to special duties on the New Jersey division as assistant road foreman of engines, and in April, 1875, he was appointed assistant superintendent of motive power of the New Jersey division. He was promoted in October, 1882, to superintendent of motive power of the same division, also of the West Jersey & Seashore and the Camden & Atlantic, including ferries and floating equipment on the Delaware river. From January 1, 1912, until the time of his death he was consulting engineer of floating equipment of the Pennsylvania Lines East of Pittsburgh and Erie, Pa. Mr. Hayward was a member of the American Society of Mechanical Engineers, the Society of Naval Architects and Marine Engineers, also of the Engineers' Club of New York and the New York Railroad Club. He was also a member of the committee of the American Railway Master Mechanics' Association, which had charge of the 1912 edition of the Locomotive Dictionary.

H. S. Hayward

Equipment and Supplies

LOCOMOTIVE BUILDING

The Illinois Central is in the market for 25 switching and 25 Mikado type locomotives.

The Philadelphia & Reading has ordered 4 passenger locomotives to be built in its own shops.

Greece.—The American Locomotive Company is reported to have received an order for 20 locomotives for export to Greece.

The Carolina, Atlantic & Western has ordered 3 ten-wheel and 1 six-wheel switching locomotives from the Baldwin Locomotive Works.

CAR BUILDING

The Philadelphia & Reading has ordered 200 hopper car bodies.

The Illinois Central is in the market for 1,000 50-ton refrigerator cars.

The Union Tank Line has ordered 500 tank cars from the Standard Steel Car Company.

The Westmoreland Coal Company has ordered 100 gondola and 100 hopper cars from the Cambria Steel Company.

The Jane Oil & Gas Company, St. Louis, Mo., has ordered 100 tank cars from the Pennsylvania Tank Car Company and 50 from the American Car & Foundry Company.

A War of Railways.—M. Segers, Belgian Minister of Marine, Railways, Posts and Telegraphs, recently visited the head office of the state railways in Paris, where 1,200 Belgians, belonging to his departments, had been drawn up to receive him. In the course of his speech M. Segers said that the present war was a war of railways, and stated that the Germans had offered as much as $10 a day to Belgian railway foremen, and $2.40 a day to ordinary employees, provided that they would return and work the Belgian railways, but these offers had been absolutely rejected. He also noted that the personnel of the Belgian railways, who had been forced to leave their country, would not be forgotten. Those who had found work, but with smaller wages than they usually earned, would be paid the difference, while those who could find no work would be paid as if they were temporarily unemployed. Pay offices had been established in Amsterdam, London and Havre.

Russian Railway Projects.—The acquirement from China by Russia of the right to construct a railway from Blagoveshchensk, on the left bank of the Amur river, to Aigun, Mergen and Harbin, with a connection between Mergen and Tsitsihar, is of great importance politically to Russia and commercially to North Manchuria. Commercially it taps large and rich tracts of territory and gives immediate access to the Amur river and to the New Amur Railway now being opened on the left of the river, and with which Blagoveshchensk is connected. Politically it binds this region to Russia, and gives her at least railway dominance over the whole of North Manchuria. She now has the railway from Vladivostok through Manchuria to Russia, and has nearing completion the railway traversing her own territory from Vladivostok north of the Amur to Karimska, where it junctions with the Siberian Railway. The railways she has now secured the right to build will permit her to place the important center of Harbin, with its direct connection southwards, in immediate touch with trade avenues which will tap the large territory of the Amur. Above all it places in the hands of Russia what is the northern section of the projected railway from Chinchow to Aigun. Americans hold the right from China to build the Chinchow-Aigun Railway, but in recent times the southern half of it has been granted to Japan by China, and now Russia has obtained the right to cover the northern section.

Supply Trade News

The Carbo Steel Post Company, Chicago, has increased its capital stock from $15,000 to $150,000.

The Union Railway Equipment Company, Chicago, has received an order for 1,000 Pries brine tank valves, to be used on 250 beef cars for Morris & Co.

The name of the Jones Safety Train Control System Company has been changed to the American Train Control Company. The offices will be retained at the same address, 608 American building, Baltimore, Md.

H. R. Sheene has been appointed sales engineer of the Union Switch & Signal Company, with headquarters in room 2039 Railway Exchange building, St. Louis, Mo. Mr. Sheene will report to the resident manager at Chicago.

Because of unsettled conditions, it has been decided not to offer United States Steel Corporation stock to employees for subscription in 1915. This will be the first year since the profit-sharing plan became operative, in which employees will not have the privilege of subscribing to stock.

The Jacobs-Shupert U. S. Firebox Company, Coatesville, Pa., has received an order for two Jacobs-Shupert fireboxes from the Royal Hungarian State Railways, following certain investigations by the motive power department of these railways. Delivery will probably not be made until peace has been declared.

Because of the death of the late Quimby N. Evans, the copartnership heretofore existing between Q. N. Evans, J. A. Almirall and W. C. Adams has been dissolved and been succeeded by the corporation of Almirall & Co., Inc. The new company will remain at the same address, 1 Dominick street, New York, and with the same personnel as the former company will continue to engage in the business of heating, ventilating and sprinkler systems and power plants.

On December 10, 1914, Judge Hazel, of the Western District of New York, handed down a decision in the suit of the Safety Car Heating & Lighting Company vs. the United States Light & Heating Company, holding patent No. 747,686, issued to J. L. Creveling, and owned by the former company, valid and infringed by the apparatus of the latter company. There were eight claims in the suit and all were sustained. The patent covers regulating devices for regulating the output of a variable speed generator and means for controlling the regulating devices to determine the output.

TRADE PUBLICATIONS

AIR COMPRESSORS.—The Chicago Pneumatic Tool Company, Chicago, has recently issued bulletin No. 34-S descriptive of the company's line of small power driven compressors.

PORTABLE ELECTRIC DRILLS.—The Independent Pneumatic Tool Company, Aurora, Ill., has recently issued circular E-2, descriptive of the company's line of Thor portable electric drills.

HEAT TREATING FURNACES.—The Quigley Furnace & Foundry Company, Springfield, Mass., has issued bulletin No. 6, descriptive of the company's Overfired Accurate Temperature Heat-treating furnaces, using gas or oil fuel.

VALVES.—The Golden-Anderson Valve Specialty Company, Pittsburgh, Pa., has issued a circular descriptive of the Golden-Anderson double cushioned triple-acting non-return valves and various other valves which are made by the company.

SCALES.—The Buffalo Scale Company, Buffalo, N. Y., has issued a booklet describing its new heavy-duty suspension-bearing center-connected railroad track scale. The essential features of this scale are the suspension bearing, the details of this bearing consisting of five parts and affording simplicity of construction, accuracy and durability. The booklet is illustrated with drawings and photographs of the scale parts and photographs of several installations already in service.

Railway Construction

CAIRO-TRUMAN & SOUTHERN.—We are told that this company which operates a line connecting Truman, Ark., with Judd Hill and Weona, has projected an extension from Weona south to Earle, 20 miles.

COLUSA & HAMILTON.—See Southern Pacific.

DEATH VALLEY.—See Tonopah & Tidewater.

DETROIT, ALMONT & NORTHERN (Electric).—An officer writes that a contract has been given to Frank Bishop, Almont, Mich., to build an extension from Almont north to Imlay City, 8.5 miles. The company has completed work on 9.35 miles of first track, and 0.92 miles of second track between Romeo and Almont. (June 19, p. 1565.)

HERSHEY TRANSIT COMPANY (Electric).—An officer writes that this company has completed the first section of five miles out of Hershey, Pa., of the line building from Hershey to Elizabethtown, 10 miles; the remaining five miles are expected to be completed early in 1915. H. N. Herr, chief engineer, Hershey. (June 12, p. 1356.)

HUDSON BAY RAILWAY.—We are told that this company, which is building from The Pas, Man., northeast to Port Nelson, on Hudson Bay, about 420 miles, is now at work on the section from mile 214 to mile 293. J. D. McArthur, Winnipeg, Man., is the contractor. The final location and survey has been completed from mile 273 to Port Nelson, a distance of 131 miles.

INTERNATIONAL RAILWAY (Electric).—This company has applied to the New York Public Service Commission, Second district, for a certificate of convenience and necessity to build a new electric line between Buffalo, N. Y., and Niagara Falls. The project has been under consideration for over a year, and the company has already bought real estate for the right of way, and has been given the necessary franchises. The company now operates street railways in Buffalo, Niagara Falls, Lockport, Tonawanda and North Tonawanda. E. G. Connett, president, Buffalo.

MISSOURI, KANSAS & TEXAS OF TEXAS.—Work of replacing the old timber structure carrying the company's tracks across East Crawford street, Denison, Tex., by a concrete subway is about 50 per cent completed. The subway will require about 1,600 yd. of concrete and will cost approximately $31,500.

MOJAVE & BAKERSFIELD.—See Southern Pacific.

NACOGDOCHES & SOUTHEASTERN.—An officer of this company, which operates a line from Nacogdoches, Tex., southeast to LaCerda, 23 miles, writes that grading work is about finished on an extension from LaCerda, southeast six miles.

NEW YORK, CHICAGO & ST. LOUIS.—Grade separation work, which will eliminate 13 highway grade crossings, is being planned by this company at Cleveland, Ohio. The tracks will be depressed and the highways will be carried over the tracks on reinforced concrete bridges. Work is to be begun early next spring and the ordinance requires that it be completed in two years. The approximate cost is estimated at $2,900,000. All work will be done by railroad company forces.

NEZPERCE & IDAHO.—An officer of this company, which operates a line from Nezperce, Idaho, west to Vollmer, 13.8 miles, writes that work is now under way on an extension from Vollmer to Tammany, 49 miles.

NORTHWESTERN PACIFIC.—An officer writes that this company has made surveys for a branch line from Healdsburg, Cal., northwest to Christine, 61 miles. Connection will be made at Christine with the existing line to Albion.

OREGON ROADS.—A committee has been formed for the purpose of securing estimates of cost, route, plans, etc., for a short proposed railroad extending from German Hall to Cold Springs on Columbia river in Oregon, a distance of about 16 miles. The Farmers' Union Grain Agency, Pendleton, Ore., is interested.

PUGET SOUND & WILLAPA HARBOR.—Work on this road, which is a 66-mile line running east from Raymond, Wash., through

Dryad to Chehalis, and then in a northerly direction until it connects with the Grays Harbor branch of the Chicago, Milwaukee & St. Paul, is nearing completion, and though it will not be finished by January 1, 1915, the specified time, it is expected to be completed during the earlier part of the year.

Rolla, Ozark & Southern.—An officer writes that this company, which was incorporated in Missouri early this year with $200,000 capital, to build an 18-mile line from Rolla, Mo., south to Anutt, has most of the right of way secured and about nine miles of grading finished, one mile of track has been laid. J. E. Walker, secretary and general manager, Rolla.

Southern Pacific.—An officer writes that construction work is now under way on the Colusa & Hamilton, from north of Glenn, Cal., to Hamilton, on 12.1 miles, and on the Willamette-Pacific, from a point near Acme, Ore., to North Bend, on 49.1 miles. In addition the Mojave & Bakersfield is projected from Cameron, Cal., to Mojave, and from Tehachapi to Treves.

Stockton, Terminal & Eastern.—An officer of this company which operates a line out of Stockton, Cal., writes that an extension has been projected from Bellota, northeast to Jenny Lind, 10.9 miles. In addition to the use of steam as the motive power gasoline motor cars will be used on the line.

Tennessee & Alabama.—An officer writes that surveys are now being made for the line projected early in 1914 from Fayetteville, Tenn., south to Huntsville, Ala., 34 miles. J. E. Hurd, chief engineer, Fayetteville, Tenn. (February 13, p. 346.)

Tonopah & Tidewater.—We are told that the Death Valley is building a 3-ft. gage line from Death Valley Junction, Cal., to Devar, 20 miles.

Willamette-Pacific.—See Southern Pacific.

RAILWAY STRUCTURES

Ashland, Wis.—The Minneapolis, St. Paul & Sault Ste. Marie will repair its ore docks at Ashland, Wis., in the near future. All work will be done by company forces.

Burlington, Vt.—We are told that a contract has been given to W. Shelton Swallow, Burlington, Vt., to build a union passenger station on Maine street in Burlington, to be used jointly by the Central Vermont and the Rutland Railroad. The new building is to be of brick construction, with stone trimmings, and will be fireproof. The cost of the work will be about $150,000.

Chicago, Ill.—The Chicago & North Western is preparing plans for replacing the old two-track swing bridge across the north channel of the Chicago river near Deering station, by a three-track Strauss bascule single leaf lift span 180 ft. long supported on cylindrical caissons. The approaches will consist of plate girders, that on the tower side being 35 ft. long; the length of the north approach not yet decided. The contract for the superstructure has been awarded to the American Bridge Company, and will require approximately 1,800 tons of steel. The contract for the substructure has not yet been awarded. Work in addition to this improvement will consist of the construction of a new all-electric interlocking plant for the protection of the bridge.

East Des Moines, Iowa.—The Chicago, Rock Island & Pacific is building a foot and highway bridge across its tracks at Thirtieth street, in East Des Moines. This bridge will be 1,084 ft. long, with a roadway 20 ft. wide and a 5 ft. walk on each side. Work on the concrete foundation has been begun and will be done by company forces. This company is also building a foot bridge 6 ft. wide and 974 ft. long across the same tracks at Twenty-sixth street.

Kansas City, Kan.—The Union Pacific is contemplating the building of a small brick freight house at Kansas City, Kan., to be constructed by company forces.

Keokuk, Iowa.—The Keokuk & Hamilton Bridge Company has awarded a contract for the erection of an 11-span bridge across the Mississippi river between Keokuk, Iowa, and Hamilton, Ill., to the Strobel Steel Construction Company, Chicago. The estimated cost is $325,000. Modjeski & Angier, Chicago, are the engineers in charge.

Railway Financial News

Atlantic Coast Line.—This company has declared a "cash" dividend of 2½ per cent on the common stock. The regular semi-annual dividends since November, 1909, have been 3½ per cent, or at the annual rate of 7 per cent. The present declaration will make 6 per cent declared in 1914.

Chicago, Rock Island & Pacific.—The $71,353,000 stock of the Chicago, Rock Island & Pacific Railway Company, the owning and operating company, which is incorporated in Illinois, was sold on December 22 under foreclosure of the collateral mortgage of the Chicago, Rock Island & Pacific Railroad, the Iowa holding company. The stock of the railway company was bid in by the bondholders' protective committee, of which James N. Wallace is chairman, the price, which is purely nominal, being $10 per share. The protective committee will now, under the agreement, distribute the stock pro rata to the railroad bondholders. The expenses of the committee and two committees of which the present is a consolidation total 44½ cents a share of stock; in other words, a little less than half of 1 per cent.

Grand Trunk.—A press despatch from London says that this company is to issue £1,000,000 ($5,000,000) 5½ per cent 3-year notes at 98½.

Lake Shore & Michigan Southern.—See New York Central & Hudson River.

Lehigh & New England.—The New Jersey Public Utility Commission has approved an issue of $1,364,000 stock.

Louisville & Nashville.—This company has declared a "cash" dividend of 2½ per cent on the common stock. The regular semi-annual dividends since November, 1909, have been 3½ per cent, or at the annual rate of 7 per cent. The present declaration will make 6 per cent declared in 1914.

New York Central & Hudson River.—Stockholders of the Lake Shore & Michigan Southern have voted to approve of the merger of this company with the New York Central & Hudson River, the merger having been approved by the stockholders of the New York Central on July 20, 1914, and the permission of the various state commissions having been obtained and the injunctions sought in the courts against the merger having been refused. The articles of consolidation of the two roads have been filed at the state capitals, where such action is necessary.

On December 23 the first meeting of the directors of the new company, the New York Central Railroad, was held and a quarterly dividend of 1¼ per cent was declared, which is the regular New York Central & Hudson River quarterly dividend. The board of directors was increased from 13 to 15 by the election of Leonard J. Hackney, of Cincinnati, Ohio, and Frank J. Jerome, of Cleveland, both of whom were directors of the Lake Shore & Michigan Southern.

Pennsylvania Company.—This company, which is the operating company of the Pennsylvania Lines West, Northwest and Central Systems has declared a dividend of 1 per cent, making a total of 4 per cent declared in 1914 as against a total of 7 per cent declared in 1913. The Pennsylvania Railroad owns all of the $80,000,000 stock of the Pennsylvania Company. This reduction of dividend, therefore, is a loss in other income to the Pennsylvania Railroad of approximately $2,400,000.

Pennsylvania Railroad.—On December 1 the Pennsylvania Railroad had 91,159 stockholders. This is an increase of 3,863 over the number on the books on December 1, 1913, and of the increase 386 is an increase in foreign holders, the total number of foreign holders of stock on December 1, 1914, being 11,882.

St. Louis & San Francisco.—The receivers have sold the $3,000,000 one-year 6 per cent certificates mentioned in these columns last week, and the certificates are being offered to the public at par.

[ADVERTISEMENT]

ANNUAL REPORT

SEABOARD AIR LINE RAILWAY

REPORT OF THE DIRECTORS FOR THE FISCAL YEAR ENDED JUNE 30, 1914.

PORTSMOUTH, VA., October 22nd, 1914.

To the Stockholders of the Seaboard Air Line Railway:

The Board of Directors submits the following report of the operations of the property for the year ended June 30, 1914:

INCOME ACCOUNT FOR YEAR ENDED JUNE 30, 1914.

	1914.	1913.	Increase.
Gross Revenue	$25,291,757.62	$24,527,864.62	$763,893.00
Operating Expenses and Taxes	18,310,394.54	17,681,612.65	628,781.89
Net Operating Revenue	$ 6,981,363.08	$ 6,846,251.97	$135,111.11
Outside Operations	(Dr.)20,360.37	(Dr.)26,314.12	5,953.75
Operating Income	$ 6,961,002.71	$ 6,819,937.85	$141,064.86
Other Income	298,996.38	220,063.88	78,932.50
Gross Income	$ 7,259,999.09	$ 7,040,001.73	$219,997.36
Rentals and Hire of Equipment	441,847.42	397,589.17	44,258.25
Applicable to Interest	$ 6,818,151.67	$ 6,642,412.56	$175,739.11
Fixed Interest Charges	3,893,935.91	3,656,558.89	237,377.02
Balance	$ 2,924,215.76	$ 2,985,853.67	$ 61,637.91†
Full 5% Interest on Adjustment (Income) Bonds	1,250,000.00	1,250,000.00	
Net Income	$ 1,674,215.76	$ 1,735,853.67	$ 61,637.91†

†Decrease.

The Gross Revenue increased 3.11 per cent., Operating Expenses and Taxes increased 3.56 per cent., and Operating Income increased 2.07 per cent.

The Operating Expenses, exclusive of Taxes were 68.45 per cent. of the Gross Revenue, as compared with 68.19 per cent. the previous year; and including Taxes, 72.40 per cent. of Gross Revenue as compared with 72.09 per cent. for the preceding year.

MILEAGE OPERATED.

The mileage of the Seaboard Air Line Railway in operation on June 30, 1913, was	3,081.98
Extensions, etc., constructed during the year as detailed on page 6	15.57
Mileage in operation June 30, 1914	3,097.55

CAPITAL STOCK.

There has been no change in the capital stock during the year.

MORTGAGE, BONDED AND SECURED DEBT.

During the year $210,000 par value 4% Refunding Bonds issued for additions, extensions, betterments and improvements, were sold, making a total of $24,010,000 par value of 4% Refunding Bonds outstanding on June 30, 1914.

The remaining $1,000,000 of the $6,000,000 par value of Three Year 5% Gold Notes, dated March 1, 1913, payable March 1, 1916, shown in the last annual report as undelivered on June 30th, 1913, were delivered during this year, making the total authorized issue of $6,000,000 outstanding on June 30th, 1914. For further details of the Company's funded debt see Table No. 4.

EQUIPMENT.

Equipment shown in last annual report as having been undelivered on June 30th, 1913, under Equipment Agreement, Series "O," viz:

7 Mail and Baggage Cars,
4 Passenger and Baggage Cars,

were received during this fiscal year.

An Equipment Agreement, Series "P" was entered into on August 15th, 1913, for the purchase of:

5 Pacific Passenger Locomotives,
35 Pacific Freight Locomotives,
5 Switching Locomotives,
1 Dummy Locomotive,
10 All Steel Passenger Coaches,
2 All Steel Express Cars,
5 All Steel Dining Cars,
500 Steel Upper and Under Frame Ventilated Box Cars,
250 Steel Under Frame Flat Cars,
250 Steel Hopper Coal Cars,

for which $473,228.20 was paid in cash and equipment trust obligations aggregating $1,900,000 were issued, payable in twenty consecutive semi-annual instalments of $95,000 each, bearing interest at the rate of 5% per annum. All of this equipment was received during the fiscal year.

There were purchased during the year, and put in service to replace Trust Equipment destroyed:

2 Passenger Locomotives,
3 All Steel Express Cars.

In addition to the equipment named above, the following were purchased:

1 Officers' Car,
4 Air Dump Cars,
2 Ballast Spreader Cars.

EXTENSIONS.

Extensions to the Company's line in Florida were completed during the year as follows:

An extension from Bartow to Pembroke, Fla.	8.74 Miles
Carpenter-O'Brien Spur, near Jacksonville, Fla.	1.96 "
Acme Spur south of Archer, Fla.	4.87 "
TOTAL	15.57 "

In addition to the above, construction is in progress on an extension easterly from Bartow, known as Lake Wales Extension, approximately 22.00 Miles

Construction work is also in progress on an extension from Pembroke to Jumeau Phosphate Plant, approximately 3.53 "

MAINTENANCE OF WAY AND STRUCTURES.

ROADWAY, TRACK AND STRUCTURES.

Roadway, track and structures of the railway have been fully maintained at a cost of $3,094,199.97, which represents an expenditure per mile of road of $1,003.24.

SIDE TRACKS.

45.60 miles of new sidings and extensions of existing sidings were constructed, and there were deducted by removal and changes of old sidings 6.35 miles, making a net increase over previous year of 39.25 miles.

There were also constructed 0.79 mile of new sidings on leased lines.

TIE RENEWALS.

The tie renewals were 1,373,362 cross ties and 590 sets of switch ties, and the cost, $592,991.32, was charged to Operating Expenses.

NEW RAIL.*

144.02 miles of new 85-pound and 10.91 miles of new 90-pound steel rail, making a total of 154.93 miles, were laid in the main line, releasing therefrom 68, 70, 75 and 80-pound worn rail. There was charged net to Operating Expenses therefor, $197,219.77, and to Capital Account, $109,774.14.

In addition, 152.38 miles of released rail was laid on branch lines, releasing 60-pound and lighter rail, and there was charged to Operating Expenses therefor, $86,755.57, and to Capital Account, $153,849.45.

BALLAST.

264,101 cubic yards of gravel and slag ballast were put under main line track at a cost of $253,185.39, of which $222,516.96 was charged to Capital Account and $30,668.43 to Operating Expenses.

TRESTLES FILLED.

5,892 lineal feet of wooden trestles were filled in, and of the total cost thereof, including culverts, $35,317.41 was charged to Operating Expenses.

TRESTLES REBUILT AND BALLAST DECKED.

There were built during the year out of creosoted timber, 5,765 lineal feet of ballast deck trestles, replacing open deck trestles, and the cost therof, $69,053.55, was charged to Operating Expenses.

TRESTLES STRENGTHENED.

Additional stringers were put in 126 trestles during the year on the Georgia Division to provide for the use of heavier power, the cost of which, amounting to $17,123.60, was charged to Capital Account.

BRIDGES.

Work has been done on twenty-eight bridges, repairing, adding signals, replacing with steel or strengthening them for heavier power. Of this number, twenty-three have been completed.

Nine of the above bridges were authorized during this year and six of the nine have been completed.

Of the bridges completed the principal ones are:

Savannah River, near Clyo, Ga., one through truss draw span 250 feet long, and two through truss fixed spans, each 125 feet long, total	500 feet.
Fishing Creek, near Great Falls, S. C., trestle elimination deck lattice girders	343 "
Boylan Avenue, Raleigh, N. C., highway overpass, truss span	150 "
Hillsboro Street, Raleigh, N. C., reinforced concrete overpass	105 "
Peachtree Road, near Atlanta, Ga., reinforced concrete overpass	109 "
Trade Street underpass, Charlotte, N. C., half through girder spans, solid concrete floor	89 "
Nottoway River, near McKenny, Va., through truss span	150 "
Little Manatee River, near Turkey Creek, Fla., through truss span	158 "
Big Alafia River, near Turkey Creek, Fla., through girder span	100 "

The total expenditures for bridge renewals during the year were $100,026.10, of which $80,094.76 was charged to Capital Account and $19,931.34 to Operating Expenses.

RAIL IN MAIN LINE.

Of the total operated main line single track mileage of the system, 3,097.32 miles are laid with steel rails of the following weights:

Miles.	Weight.	Miles.	Weight.	
10.92	90 lb. rail.	60.48	63.5 lb. rail.	
346.11	85 "	5.72	60.5 "	
75.25	80 "	496.47	60 "	
1,207.65	75 "	35.41	60 "	(resawed)
166.23	70 "	205.61	58 "	
210.49	68 "	258.11	56 "	and lighter.
18.87	65 "			

The above does not include:

SECOND TRACK.

Northward from Hamlet, N. C.:	
9.09 Miles	90 lb. rail
.52 "	75 "
At Birmingham, Ala.:	
1.43 Miles	75 "
1.62 "	60 "

LEASED LINES.

Silver Springs Branch:	
1.20 Miles	60 "
.70 "	56 "
Amelia Beach Branch:	
2.00 Miles	50 "

MAINTENANCE OF EQUIPMENT.

The equipment of the Railway was fully maintained during the year at a cost of $3,404,470.88.

Included in the cost of maintenance is $82,505.79, representing value of equipment destroyed or retired from service during the year, and credited to the Cost of Equipment.

The cost of maintenance per article owned was as follows:

Average cost per annum per Locomotive owned	$2,506.03
Average cost per annum per Passenger car owned	766.11
Average cost per annum per Freight car owned	60.91

*Due to a typographical error, it was stated in last year's annual report that 130.05 miles of the new rail which was laid in the main track for the fiscal year was 75-pound rail; it should have stated 85-pound rail.

GENERAL REMARKS.

Extensive additions and improvements have been made during the year to the Union Passenger Station at Cordele, Ga., together with revision of track layout to serve same.

A Union Passenger Station is now under construction at Hurtsboro, Ala.

Passenger stations have been built at Littleton, N. C., McBee, S. C., Lawrenceville, Ga., Palmetto, Fla., Bradentown, Fla., and extensive additions and improvements have been made to the Passenger station at Quincy, Fla., and are now being made to the passenger station at Rockingham, N. C.

At Tallahassee, Fla., an umbrella shed with granolithic walks has been provided in connection with the present passenger facilities, and a passenger shelter shed with granolithic walks is inow under construction at Portsmouth, Va.

Combination Passenger and Freight Stations have been constructed during the year at Lee, Fla., and Thalman, Ga.

A brick freight depot has been built at Greenwood, S. C., and the one at Charlotte, N. C., mentioned in last year's report, has been completed. Extensive additions and improvements have been made to the freight depot at Lawrenceville, Ga.

At Norfolk, Va., there has been built during the year a receiving and delivery freight warehouse.

A brick storage warehouse has been built during the year at Raleigh, N. C.

Extensions have been made during the year to the yards at Monroe, N. C., and Portsmouth, Va., and the yard extensions at Richmond, Va., Raleigh, N. C., Hamlet, N. C., and Hutchinson Island, Ga., mentioned in last year's report, have been completed and put in operation.

During the year, an important industrial track was built in the City of Columbia, S. C., to serve present and future development.

The change in the location of the compress belonging to the Atlantic Compress Company at Hutchinson Island, Savannah, Ga., which was mentioned in last year's report, has been completed, thus making available the 130,000 square feet of additional shed room therein mentioned. Additional tracks to serve the new location have also been completed.

The second track work and grade revision, beginning at Hamlet, N. C., and running 9.61 miles northward thereof, mentioned in last year's report, has been completed, giving a five-tenths per cent compensated grade line which will fit in with the plan for the ultimate development of the line between Norlina and Hamlet, N. C.

A large amount of dredging has been done at Tampa, Fla., and Savannah, Ga., during the year to maintain proper depth of water.

The water station and pumping facilities including reservoir at Apex, N. C., mentioned in last year's report, have been completed and put in operation.

Adequate water supply and pumping facilities were provided for Denmark, S. C., water station during the year.

The mechanical coal elevator at Richland, Ga., mentioned in last year's report, has been completed. There is now nearing completion a reinforced concrete coal elevator at Savannah, Ga.

The fifteen thousand ton capacity coal storage plant at Savannah, Ga., and the extension of the Jacksonville storage plant to give a capacity of fifteen thousand tons, both mentioned in last year's report, have been completed and put into operation.

At Seddon Island, Tampa, Fla., the steel phosphate elevator, with two conveyors, together with necessary tracks, wharves and dredging, mentioned in last year's report, has been completed and put in operation.

The eighty-five foot turntable at Hamlet, N. C., mentioned in last year's report, has been completed.

Additional fire protection facilities have been provided at Seddon Island, Tampa, Fla., and there is now being constructed at Hutchinson's Island, Savannah, Ga., a one-hundred thousand gallon capacity steel tank with pipe lines for auxiliary fire protection.

A modern interlocking plant is now in course of installation at Pembroke, N. C.

5 sets of track scales were rebuilt with concrete foundations and steel I beams, replacing wood.

245 industrial sidings and extensions to industrial sidings already existing have been constructed or are in process of construction.

89 depots and freight stations have been constructed or substantially added to during the year.

47 passing tracks have been constructed or extended, or are in process of construction.

8 old water tanks have been replaced with modern 50,000 gallon tanks during the year and suitable pumping facilities provided.

The use of creosoted piling has been continued in maintenance work on docks, wharves and trestles.

During the year there have been constructed and placed in operation additional telephone dispatching circuits between Monroe, N. C., and Atlanta, Ga., 272 miles, and between Bartow and Pembroke, Fla., 9.00 miles. This aggregates 1655 miles in operation on June 30, 1914.

In order to insure a proper valuation of the Company's property, under Section 19-A of the Federal Act to Regulate Commerce, it became necessary to organize a special force to do this work. A Valuation Committee was created and they have made much progress in the preparation of maps, research work and the assembling of cost data, etc. The cost during the year, amounting to $14,983.29, has been charged to Operating Expenses.

The Directors acknowledge with appreciation the faithful and efficient services of the officers and employees of your company during the year.

By order of the Board:

W. J. HARAHAN,
President.

TABLE No. 9.

EXPENDITURES FOR IMPROVEMENTS, BETTERMENTS AND EXTENSIONS CHARGED TO CAPITAL ACCOUNT.

YEAR ENDED JUNE 30, 1914.

SUMMARY OF EXPENDITURES:

Additions and Betterments on Existing Mileage	$1,767,009.85
Equipment Acquired	2,488,165.15
Expenditures for Extensions	86,928.51
TOTAL AS ABOVE	$4,342,103.51

TABLE No. 10.

TRAFFIC STATISTICS

YEAR ENDED JUNE 30, 1914, COMPARED WITH YEAR ENDED JUNE 30, 1913.

	1914.	1913.	INCREASE OR DECREASE.
Average miles operated	3,084.21	3,073.58	10.63
FREIGHT TRAFFIC.			
REVENUE FREIGHT.			
Number of tons carried	10,410,986	10,409,242	1,744
Number of tons carried one mile	1,575,008,722	1,538,446,241	36,562,481
Number of tons carried one mile per mile of road	510,668	500,539	10,129
Average distance hauled each ton	151.28	147.80	3.48
Total Freight Train Revenue	$17,307,034.45	$16,788,111.56	$518,922.89
Average amount received from each ton	$1.66.238	$1.61.281	$.04.957
Average receipt per ton per mile	$.01.099	$.01.091	$.00.008
Freight Train Revenue per mile of road	$5,611.50	$5,462.07	$149.43
Freight Train Revenue per train mile	$2.89.127	$2.68.352	$.20.775
Average number of tons per train mile	263.12	245.91	17.21
Average number of tons per loaded car mile	14.96	15.10	—.14
ALL FREIGHT (Including Company's Material, hauled free).			
Number of tons carried	12,379,847	12,093,055	286,792
Number of tons carried one mile	1,791,417,676	1,729,894,658	61,523.018
Average number of tons per train mile	299.27	276.52	22.75
Average number of tons per loaded car mile	17.00	16.96	.04
PASSENGER TRAFFIC.			
Number of Passengers carried	5,146,791	4,928,125	218,666
Number of Passengers carried one mile	247,690,882	237,424,214	10,266,668
Number of Passengers carried one mile per mile of road	80,309	77,247	3,062
Average distance carried each Passenger	48.13	48.18	—.05
Total Revenue from Passengers	$5,430,531.28	$5,221,199.82	$209,331.46
Average Amount received from each Passenger	$1.05.513	$1.05.947	—$.00.434
Average receipt per Passenger per mile	$.02.192	$.02.199	—$.00.007
Passenger Revenue per train mile	$.88.974	$.91.760	—$.02.786
Total Passenger Train Revenue	$6,866,901.46	$6,654,615.17	$212,286.29
Passenger Train Revenue per mile of road	$2,226.47	$2,165.10	$61.37
Passenger Train Revenue per train mile	$1.12.507	$1.16.951	—$.04.444
Average number of Passengers per train mile	40.58	41.73	—1.15
Average number of Passengers per car mile	7.86	7.93	—.07
REVENUE AND OPERATING EXPENSES.			
Passenger and Freight Train Revenue	$24,173,935.91	$23,442,726.73	$731,209.18
Passenger and Freight Train Revenue per mile of road	$7,837.97	$7,627.17	$210.80
Gross Revenue	$25,291,757.62	$24,527,864.62	$763,893.00
Gross Revenue per mile of road	$8,200.40	$7,980.23	$220.17
Gross Revenue per train mile	$2.09.025	$2.04.995	$.04.030
Operating Expenses	$17,311,394.54	$16,725,612.65	$585,781.89
Operating Expenses per mile of road	$5,612.91	$5,441.74	$171.17
Operating Expenses per train mile	$1.43.071	$1.39.786	$.03.285
Net Operating Revenue	$7,980,363.08	$7,802,251.97	$178,111.11
Net Operating Revenue per mile of road	$2,587.49	$2,538.49	$49.00
Net Operating Revenue per train mile	$.65.954	$.65.209	$.00.745

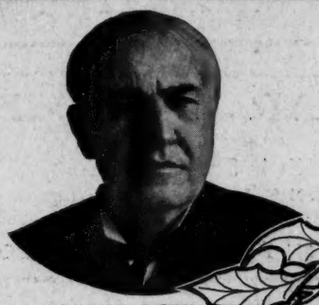
Railway Age Gazette

SECOND HALF OF 1914—No. 26 FIFTY-NINTH YEAR

NEW YORK: Woolworth Building
CHICAGO: Transportation Building

NEW YORK—DECEMBER 25, 1914—CHICAGO

CLEVELAND: Citizens Building
LONDON (ENGLAND): Westminster



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DEC 28 1914

With the Compliments of the Season

Greetings
Greetings to those 22 Railroads who in the recent year of careful buying have newly adopted
The Edison Storage Battery
Greetings to our best salesmen, our earlier Customers, and
Greetings to those Railroads who have left until 1915 the Important Work of Raising their Train Lighting and Signaling to the Edison Standard.

EDISON STORAGE BATTERY CO.
Orange, New Jersey
Distributors in
New York, Chicago, Boston, Cleveland, Washington, San Francisco, Los Angeles, Portland, Ore., Seattle.

THE PLANT OF THE EDISON STORAGE BATTERY CO.
was not affected by the Fire in Edison Phonograph Works December 9th, and there has been no interruption to business.

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SARCO MINERAL RUBBER ASPHALTS

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SARCO Bituminous Putty
SARCO BM Paint
SARCO Refrigerator Compound
SARCO Mineral Rubber Fluxes
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SARCO PRODUCTS INSURE PURITY AND RELIABILITY
Promptness—Service—Efficiency

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Cast Iron Smoke Jacks
Light Fire-Proof Smoke Jacks
Ventilators All Materials
Cast Iron Chimneys
Pump-House Stacks
Forge Jacks

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A PERFECT VARNISH FOR EVERY PURPOSE

Perfect varnish is born of efficiency and economy. Berry Brothers' Railway Varnishes combine the greatest economy consistent with the highest efficiency.

BERRY BROTHERS
(Incorporated)
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CHASE GOAT BRAND CAR PLUSHES

ARE THE STANDARD

Twenty-five Years of Use Has Demonstrated Their Superiority in Finish, in Fastness of Color and in Strength of Fabric

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89 Franklin Street, BOSTON 326 W. Madison Street, CHICAGO 321 Fourth Avenue, NEW YORK

Universal Keyed Yokes

Universal Draft Gear Attachment Co.
Railway Exchange Building, CHICAGO

Bay State Brand Mohair Plush

Manufactured by the

Massachusetts Mohair Plush Co.

First Manufacturers of Linen Warp Plushes in America

Our Plushes are excelled by none

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The National Standard for car curtains and car upholstery. Twenty years' service tests have established its superiority to any other curtain material.

AGASOTE

For car headlinings and interior trim. A homogeneous waterproof board of great density and tensile strength. It will not warp, blister or separate.

FIREPROOF AGASOTE

Non-conductive qualities of heat and cold make it peculiarly well adapted for headlining and interior trim for steel fireproof passenger cars, entirely eliminating the disadvantage of steel for interior trim and giving the appearance of wood finish.

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797 Monadnock Bldg., San Francisco

The MODERN WAY of handling ASHES is by the PNEUMATIC SYSTEM

Write and let us tell you all about it.

GREEN ENGINEERING CO.
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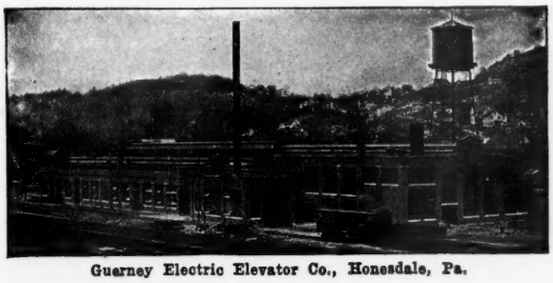
Catalogue 8—GECO Pneumatic Ash Handling Systems
Catalogue H—Green Chain Grate Stokers.



Guerney Electric Elevator Co., Honesdale, Pa.

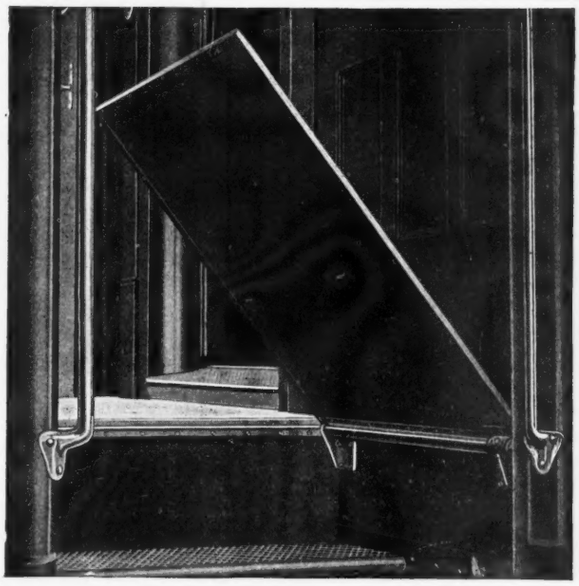
Buildings with Individuality

Lupton Products for Daylight and Natural Ventilation are found in buildings of a high order of design and construction because of the distinctive Lupton individuality of these products. Every Lupton Product is made in several types, each of which is designed to fill some very definite purpose. The discriminate use of the wide variety of these types gives unequalled results in light and ventilation.

Our catalogue gives some interesting information about Lupton Products and Lupton Service.

David Lupton's Sons Company
Janney Street and Allegheny Avenue
Philadelphia, Penna.

Sales Offices: Chicago, New York, Pittsburgh.
A. B. Ormsby Co., Ltd., Toronto, Canadian Manufacturers.



Why The Edwards Improved Metal Trap Door?

Edwards' Improved Metal Trap Door will not warp or swell. It weighs a fraction more than wood, but guarantees long life and longer service.

Made of 3/16-inch steel plate, reinforced on the edges; it is free from corrugations or ribs that catch dust and dirt.

Flat torsional springs counterbalance the weight of the door—lifting is operated by foot plunger that is strong, positive and absolutely dependable. Let us send the Edwards' catalog.

THE O. M. EDWARDS CO., Inc.
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Window Fixtures.
All Metal Sash Balances.
Metal Stop Casings.
Metal Extension Platform Trap Doors.
All Metal Shade Rollers.
Top, Bottom and Side Weather Stripping.

OPEN HEARTH STEEL

LOCOMOTIVE PASSENGER AND FREIGHT SERVICE

SMOOTH FORGED OR ROUGH TURNED

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Give 19% Greater Capacity When Icing is Not Required

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The Bohn patent removable tank has been adopted by the

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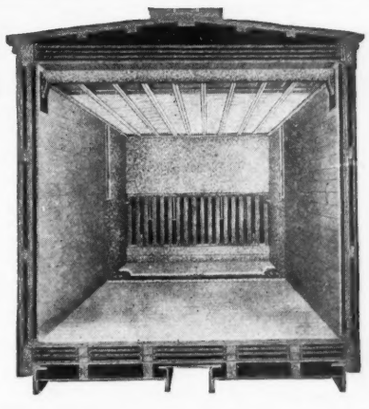
Chicago Great Western
Chicago, Burlington & Quincy
New York Central Lines
Canadian Pacific
Erie R. R.
Northern Pacific Ry.
Soo Line
Illinois Central
Great Northern
Chicago, Milwaukee & St. Paul
Wells, Fargo & Co.
M. D. T. Co.

Our latest improvement is a Galvanized Pressed Steel Bulkhead. Send for our literature. Any car builder can install them.

Write for a complete set of blueprints and specifications.

White Enamel Refrigerator Co. ST. PAUL, MINN.



3

Air Brake Education

No. 11

Who Should Instruct?

ASTONISHING numbers of people and organizations, including brake manufacturers, have undertaken to furnish Air Brake Education.

In recent years, however, there has been throughout the railroad world, a definite effort to bring common sense to bear upon the work of air brake training and instruction.

The consensus of judgment now is, that no single individual or institution is in such an advantageous position to plan, supervise, and make Air Brake Education effective as the railroads themselves.

It is true that many factors may *contribute* to the success of a railroad department or system of air brake instruction. For instance, the engineering information and experience of air brake builders are essential primarily. But nothing can take the place of railroad authority and initiative in advocating with the emphasis of their own needs, the importance of that instruction in air brake work required by each class of railroad employees.

We very strongly recommend that the executives of each road assume the direct responsibility of inaugurating and maintaining such a system of Air Brake Education for their officers and employees as will result in the highest practical efficiency for every man who has anything to do with air brakes. And having, from long study and experience, acquired expert knowledge as to successful methods of air brake instruction, we are only too glad to co-operate with railroad men in developing that system of practical Air Brake Education best suited to the conditions.

The degree of interest assumed by any road in the training of its own organization in air brake matters, as contrasted with leaving such instructions to others, determines largely the standard of efficiency which obtains in brake operation.

Westinghouse Air Brake Co.

Pittsburgh, Pa.

NEW YORK	CHICAGO	ST. LOUIS
City Investing Bldg.	Ry. Exchange Bldg.	Security Bldg.

(This is the eleventh of a series of papers covering a practical review of the essential elements of Air Brake Education.)

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Kolesch & Co.

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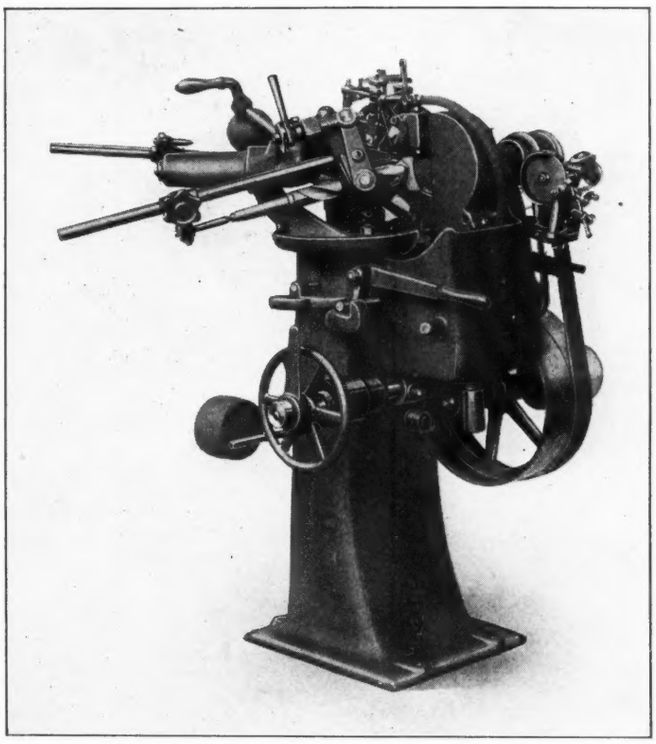

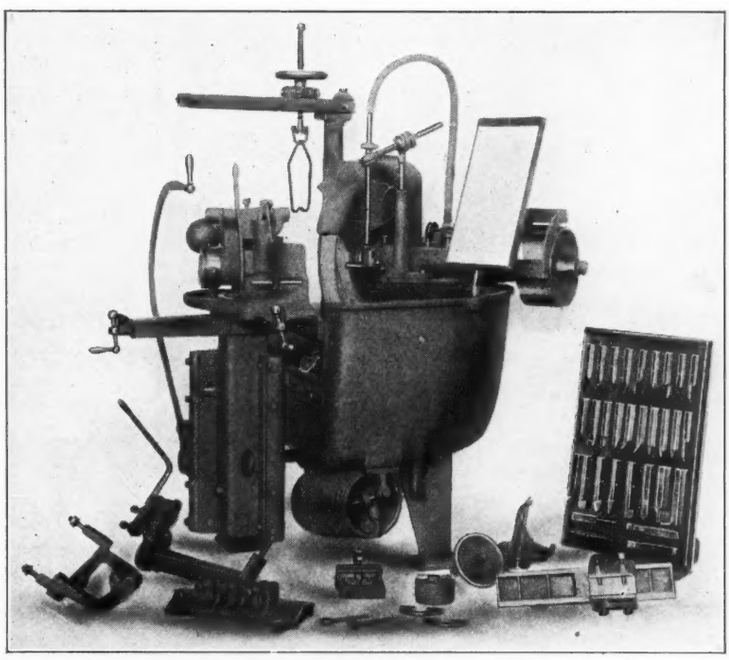

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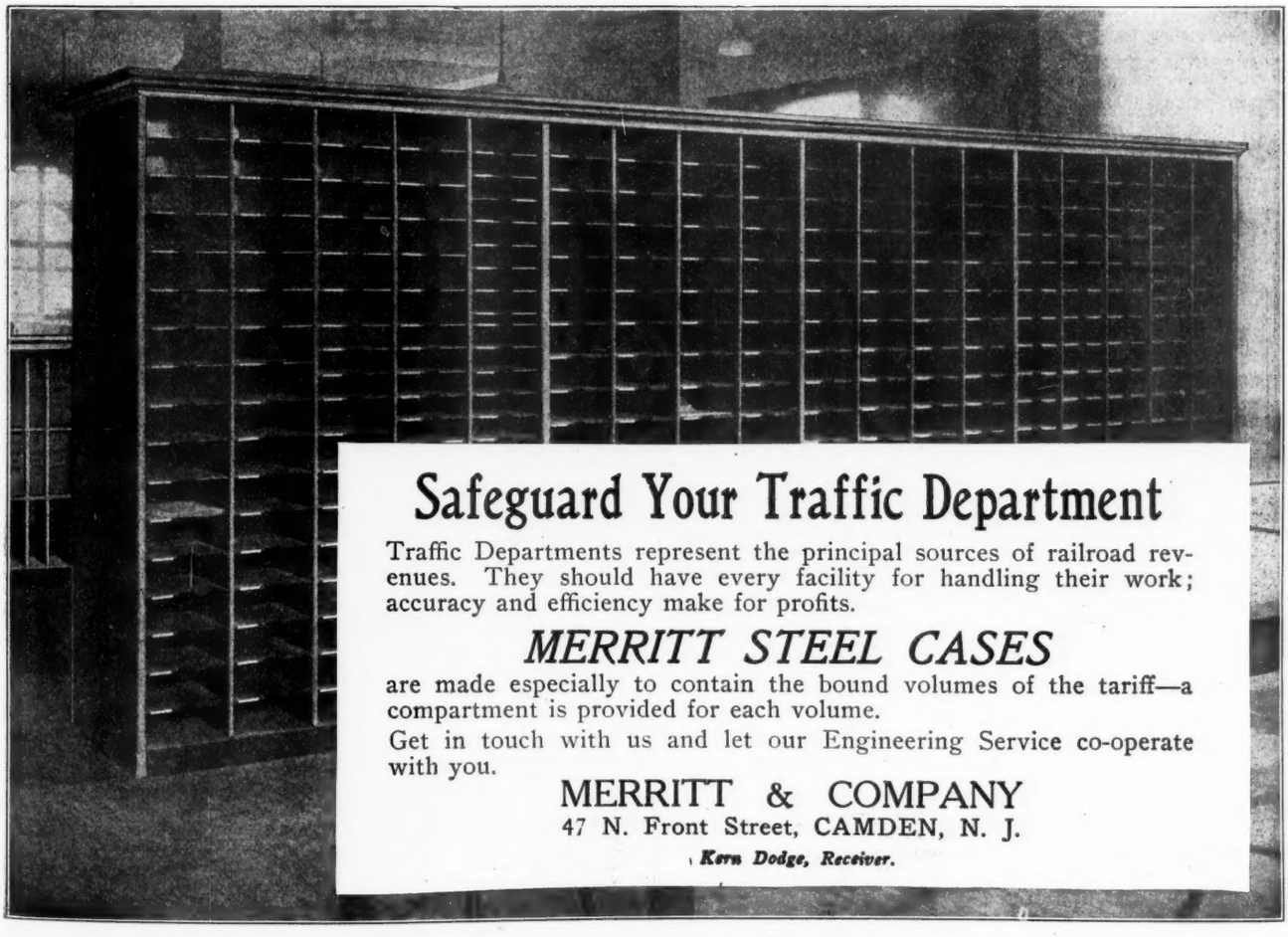

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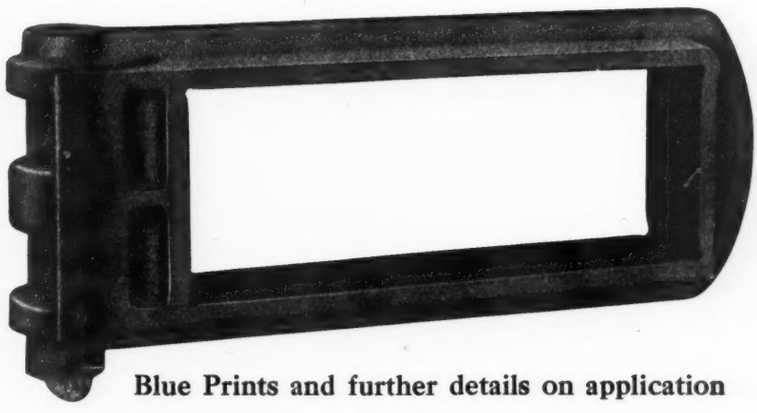

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Sellers & Co., Inc., Wm.

LATHES, TURRET.
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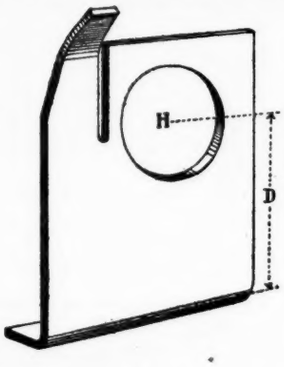

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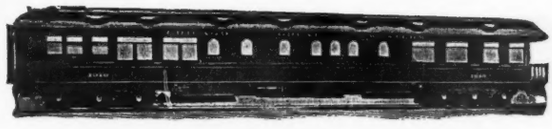

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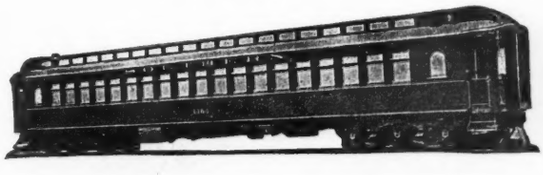

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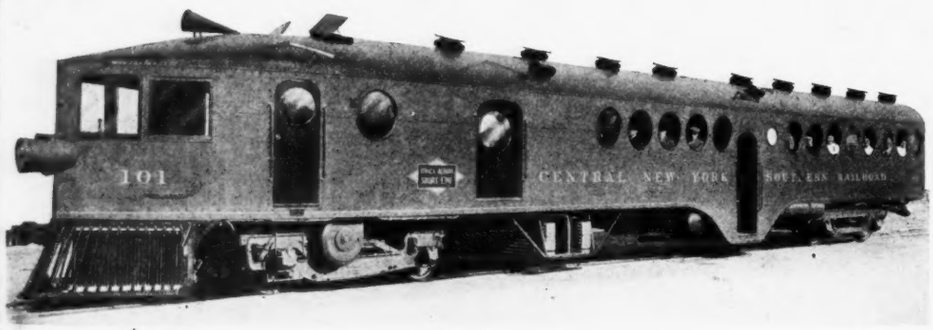

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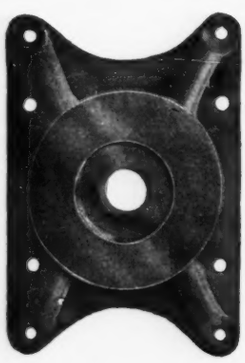

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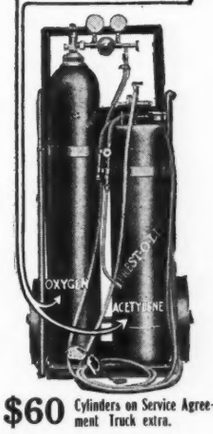

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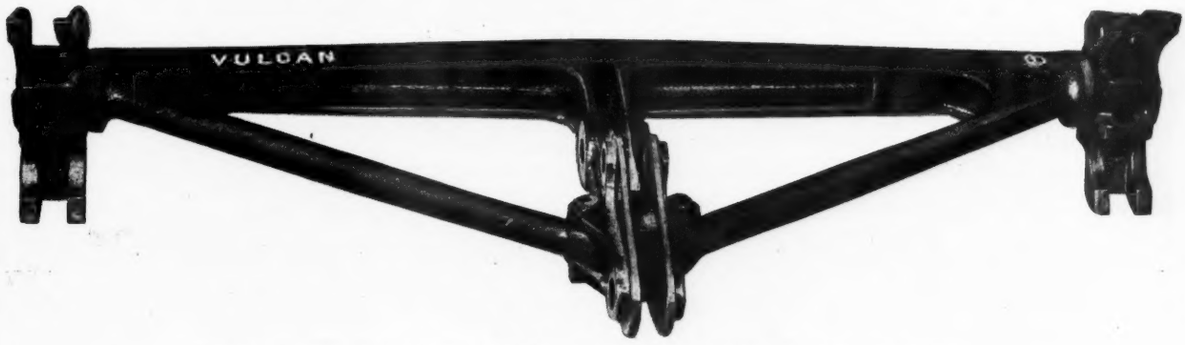

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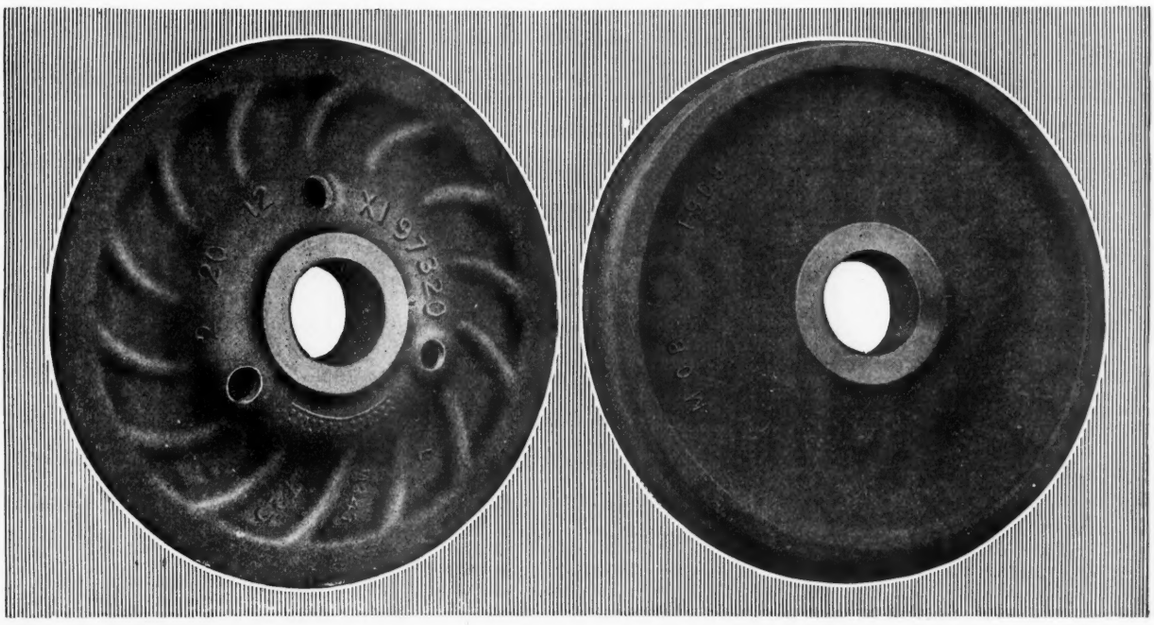

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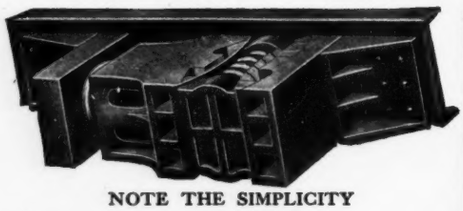

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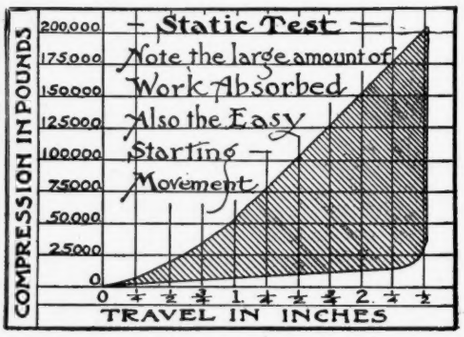

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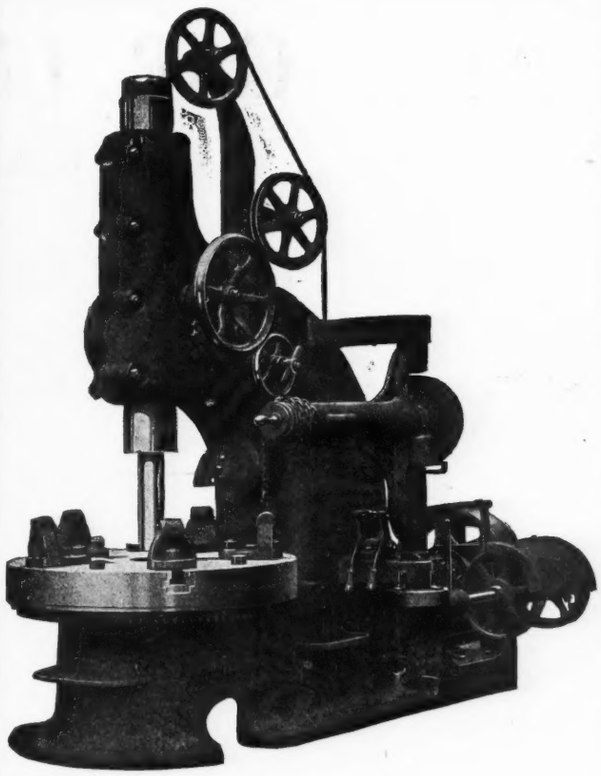

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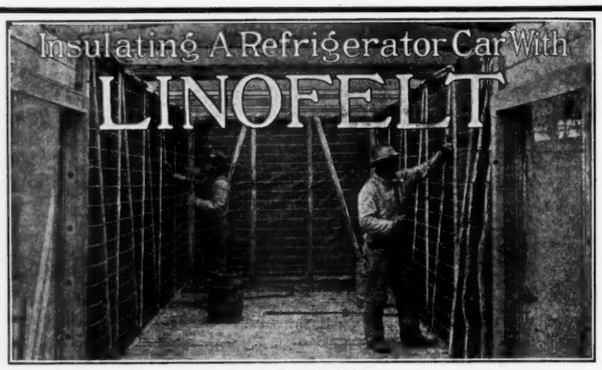

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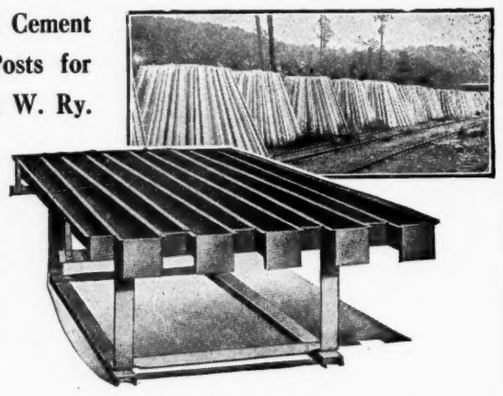

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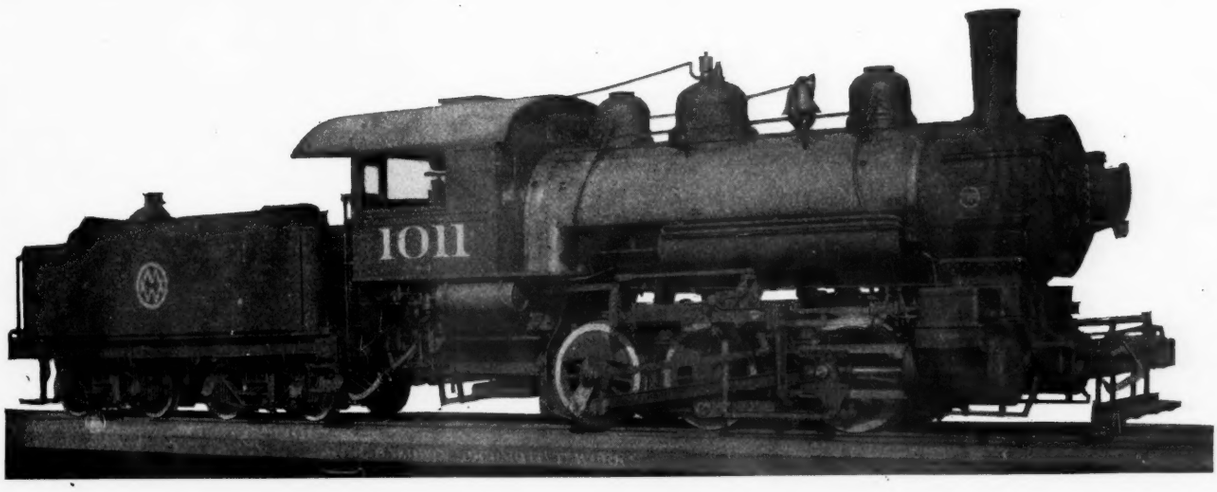

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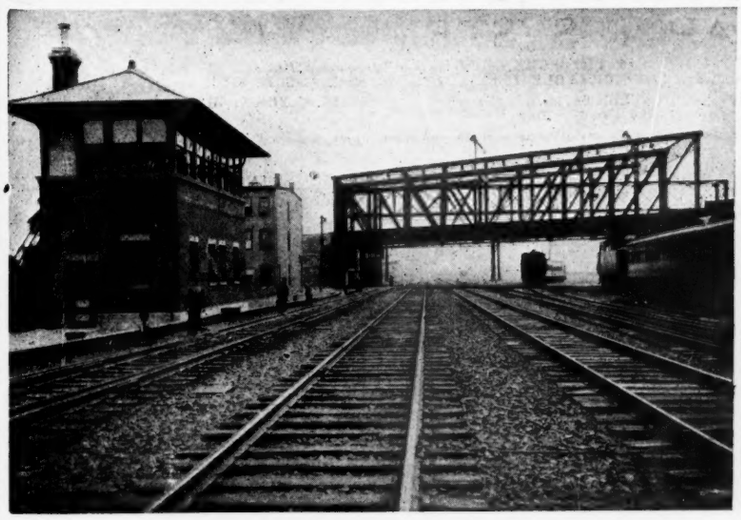

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EDITORIAL ANNOUNCEMENT

Annual Statistical Issue

In next week's issue of the Railway Age Gazette, January 1, 1915, we shall review the progress of the railways during the past year, both by the presentation of carefully compiled statistics and also by a series of significant comments by authorities on the various phases of the railway industry as well as on the relation of the railways to the public.

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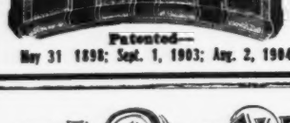

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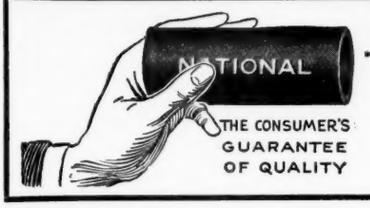

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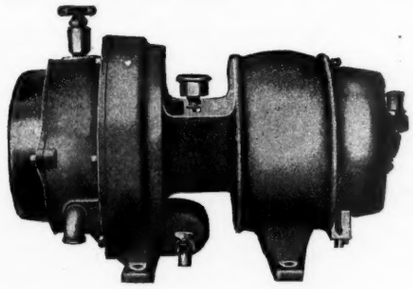

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Speed. . . 2600 R. P. M.
Ball Bearings.

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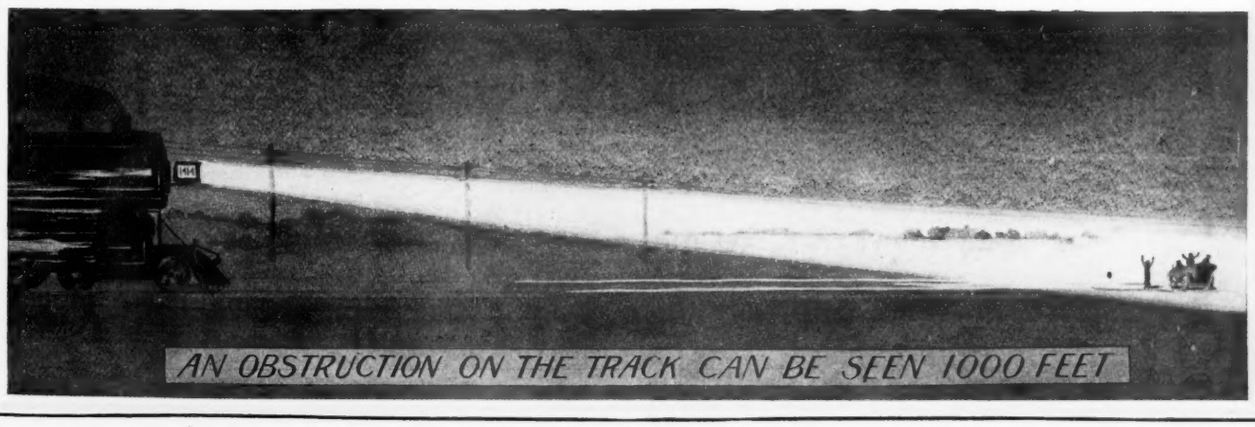

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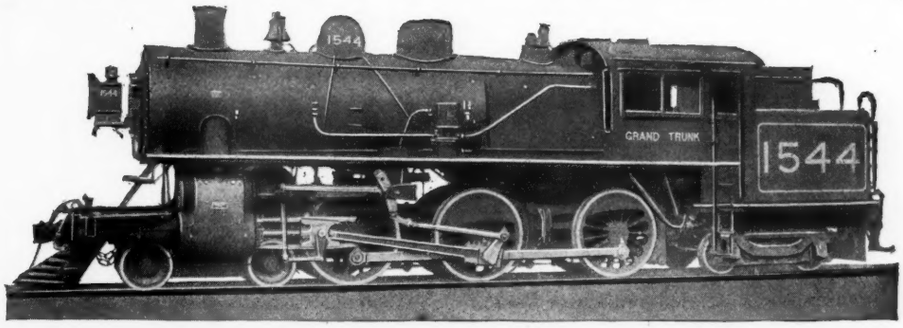

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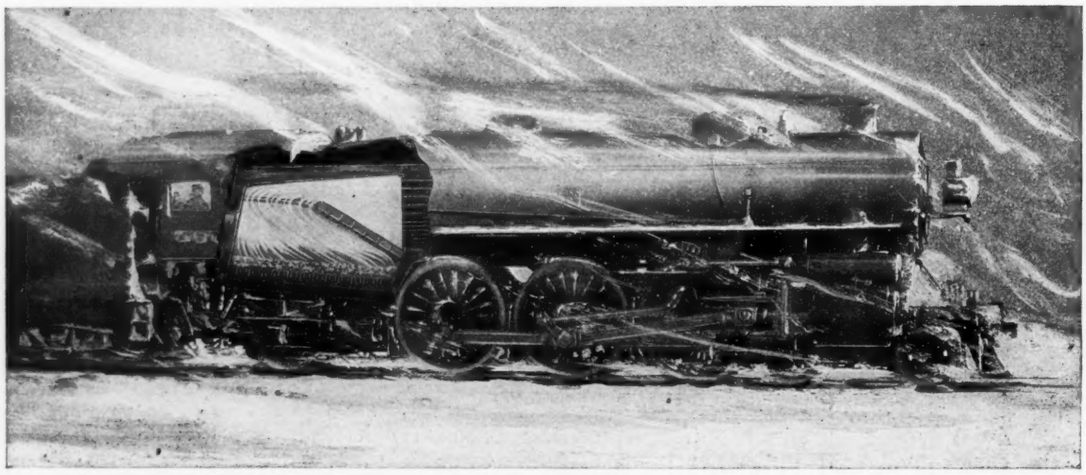

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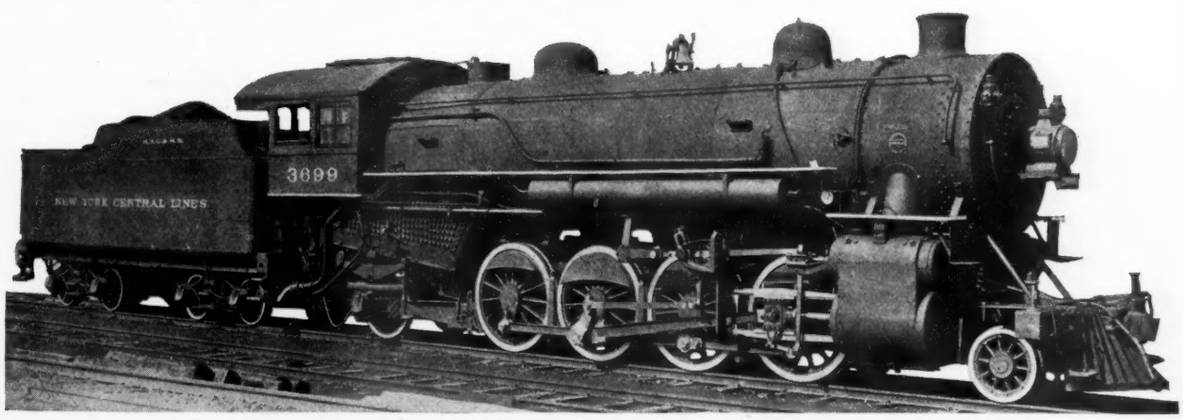

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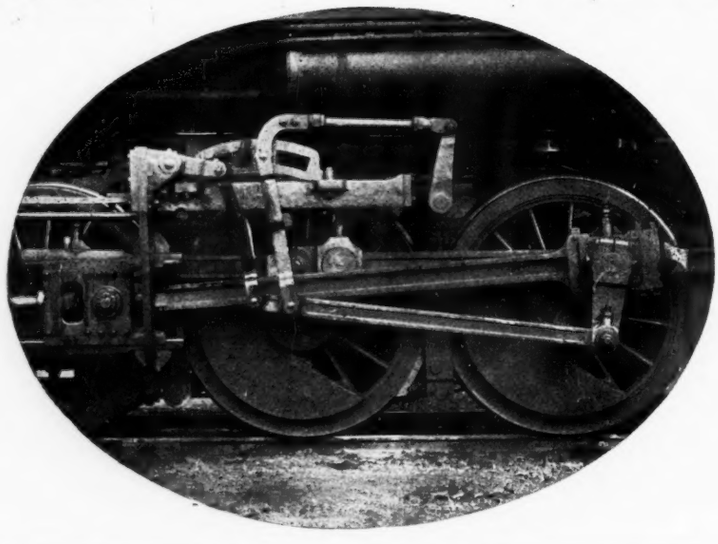

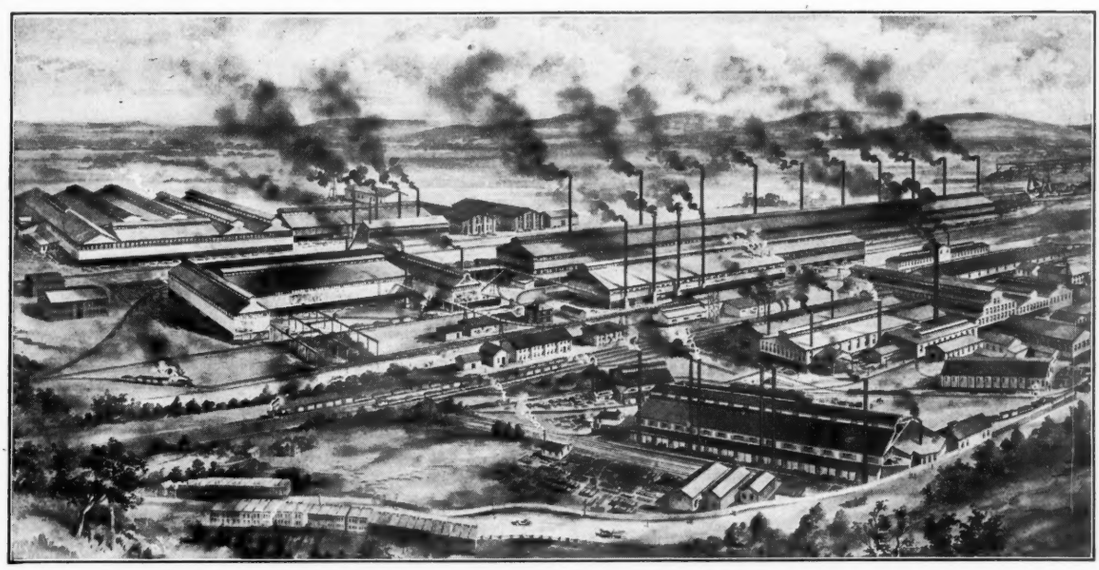

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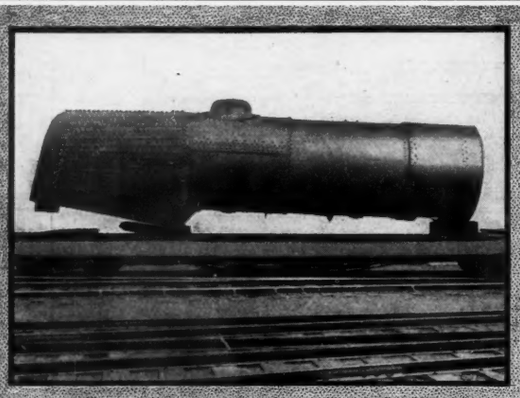

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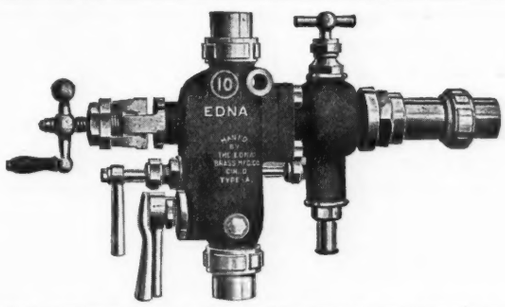

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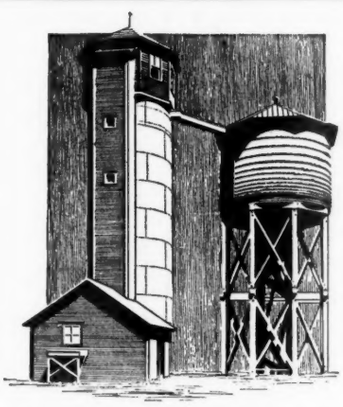

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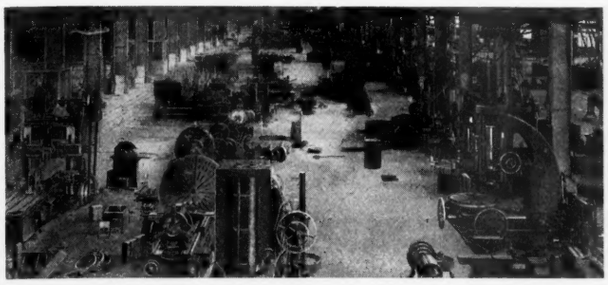

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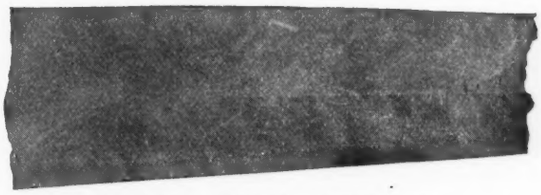
Split Ingot, showing blow-holes.



Split Ingot, Typical Armco Iron.

The Fight for Durability

Chapter IV.

Not many manufacturers know the condition of the inside of an ingot before it is rolled.

Gases that appear in the form of blow holes and a honeycombed condition of the interior of the ingot, play havoc with the durability of the metal, and its fitness for galvanizing or enameling.

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The American Rolling Mill Co.

AMERICAN ARMCO INGOT IRON

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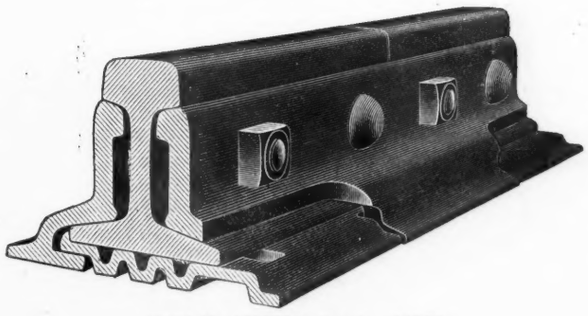

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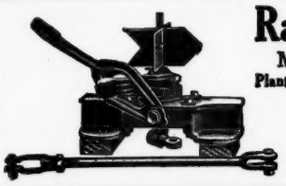

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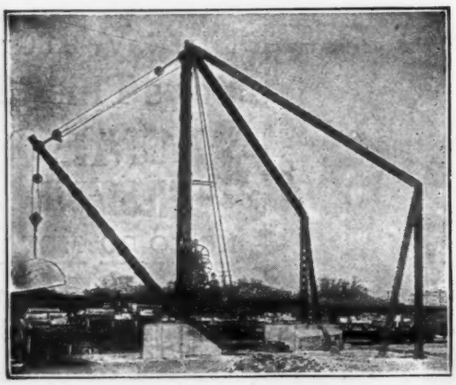

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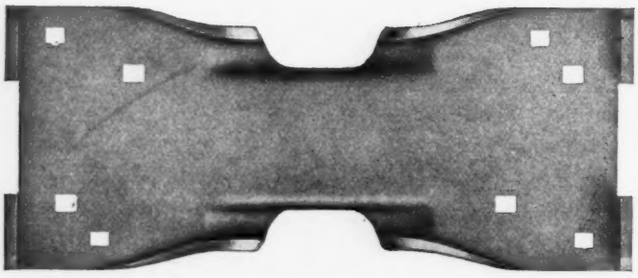

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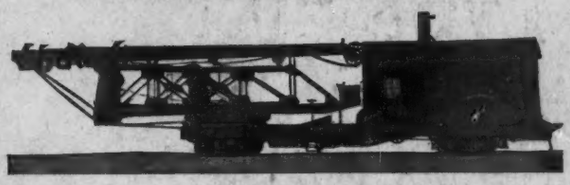

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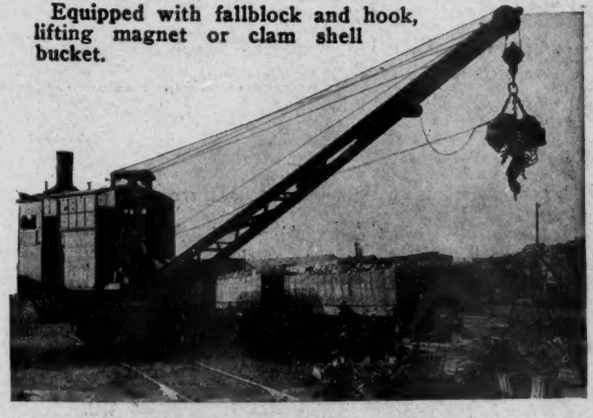

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6

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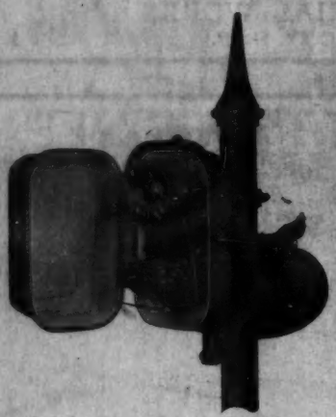

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